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A REVISION OF THE  
TROPICAL AND SUBTROPICAL SPECIES OF THE  
EULOPHID GENUS *PEDIOBIUS* WALKER  
(HYMENOPTERA: CHALCIDOIDEA)

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# A REVISION OF THE TROPICAL AND SUBTROPICAL SPECIES OF THE EULOPHID GENUS *PEDIOBIUS* WALKER (HYMENOPTERA: CHALCIDOIDEA)

By G. J. KERRICH

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## SYNOPSIS

The species of this genus have been studied, so many as found practicable, from Africa south of the countries bordering the Mediterranean, from Asia south of the Caucasus and Himalayas, and from Australia. Two are regarded, at the species level, as common to all three continents; one known previously only from eastern Australia and one European species are recorded from southerly India. One African form is reduced in status to subspecies, six new synonymies are proposed and one species is recalled from synonymy. Seven new species are described from Africa, six from Asia, one from New Guinea and one from Australia. A new name is proposed in replacement of an overlooked secondary homonym. Lectotypes of the Waterston species and a neotype of one Risbec species are designated. A key is given to the African species, and another to the Asiatic and Australian species: species common to Africa and Australia or introduced are included in both. One new species is described from the neotropics and is compared with species from other parts of the world. A host-parasite list is given. Most of the species studied are associated with crop-plants.

## INTRODUCTION

THIS genus was, until 1953, known under Förster's name *Pleurotropis*, and in previous decades became well known under that name on account of the recognition of the economic importance of a number of species. Until less than 60 years ago,

generic determination relied essentially on the keys of Förster (1856) and Thomson (1878), though Thomson also included *bimacularis* Dalman (*Mestocharis*). It would seem to have been more difficult to attain a generic determination from Ashmead (1904) and Schmiedeknecht (1909), though Crawford attributed a few species correctly to this genus.

A more satisfying definition of the genus was given by Waterston (1915), who laid a basis for our knowledge of the African species. It was Ferrière (1953) who established *Pediobius* Walker as the senior synonym.

Waterston's key and that of Masi (1940) have been used, together with determined material in the collection of the British Museum (Natural History), in the present author's attempts to name African material submitted to the Commonwealth Institute of Entomology (hereafter abbreviated to CIE). The present more intensive study has shown, however, that despite the collaboration with his artist described by Waterston, Terzi's beautiful drawings were not as accurate as one had been led to suppose, nor were drawings and descriptions fully in conformity in every case. Masi (1940) included species described since 1915 and three forms described as new: his key was, in some respects, more satisfactory than that of Waterston; but he does not seem to have received material of species described by other authors for study, and does appear to have been misled by Terzi's drawings as regards some features. His placement of some species after his key couplet 2 seems difficult to explain. The keys of Risbec (1951, 1958), based partly on Masi (1940), have not been used for making determinations: though his descriptions were extensive, he appears to have placed mixed series under one name, old or new, and some of his species were described from the male sex only, several from single males.

The only key to the species of southern Asia extant is that of Ferrière (1933), who included seven species, of which six are valid. Ferrière later (1940) described another species from Indonesia.

Our knowledge of the holarctic species was not placed on a more satisfactory basis until more recently. Graham (1959) gave a key to this, among most genera of Eulophidae other than Tetrastichinae, for the British species, and was rather soon followed by Bouček (1965), who wrote a comprehensive revision of the European species. The nearctic species have been treated by Burks (1966).

The present study arose from a request that I should give unequivocal determinations to the species associated with the Oil Palm Hispid in West Africa. Waterston (1925) had misdetermined one of these as one of his own species, and stated that the others must await treatment at a later date. This he never undertook. It was found necessary to obtain a clearer appreciation of the range of variation of the species, and that entailed a wider knowledge of the African forms. When such knowledge had seemed to attain a sufficiently satisfactory level, a preliminary diagnosis of the forms was given and the two new species were validated (Kerrich, 1970), so that the names could be applied by field entomologists in both Ghana and the Ivory Coast.

Another task requiring fulfilment was the designation of lectotypes of Waterston's African species, except for one that had, presumably by the author, been labelled and another that, by elimination, had been explicitly fixed.



It seemed natural to extend this study to the species of southern Asia, and this has proved immediately useful, since rather much material has been received from that area during the progress of this work, and some specific determinations have been given, which otherwise could not have been or not with confidence. Most of the generically determined material received by the CIE from that area has now been treated. It would have seemed a pity not to have included also a distinct species of economic importance received from the Caribbean area.

Thus, most regions of the world have now been covered. An exception is the Eastern Palaearctic, where some species have been described from Japan and one validated from Siberia by Walker. Two species are known to occur in New Zealand. A few species from Australia are treated here with the Asiatic: one, which I had confused with an Asiatic, is described as new; one, described from Australia, has been found also in India; and two, at the species-level, are considered as tropicopolitan. Assuredly, some species validated by Girault under generic names other than *Pleurotropis* belong here, but it would seem more profitable to base a study on freshly reared material before attempting to recognize his mutilated types. It seems that in the neotropics and near neotropics, the genus is replaced ecologically by *Horismenus*, hence the extreme paucity of species. The real centre of distribution of *Pediobius* is evidently in Africa: among the generically determined material received by the CIE a number of series of less distinctive species await further study.

In the treatment of species that follows, only the female specimens have been studied and described, except in a few cases in which it has been found necessary to make mention of the males also.

Abbreviations of names of Institutes and of Institutions in which type and other material is deposited are as follows:

BMNH	British Museum (Natural History)
CIE	Commonwealth Institute of Entomology
CIBC	Commonwealth Institute of Biological Control
USNM, Washington	United States National Museum
ORSTOM, Paris	Office de la Recherche Scientifique et Technique Outre-Mer, Bondy (Seine)
MRAC, Tervuren	Musée Royal de l'Afrique Centrale, Belgium
MCSN, Genoa	Museo Civico di Storia Naturale
ANIC, Canberra	Australian National Insect Collection
IARI	Indian Agricultural Research Institute, New Delhi

Locations of holotypes of all species are stated. Holotypes of new species are deposited in the BMNH with the exception of the Australian and New Guinean species described as new, of which the holotypes are deposited in the ANIC, Canberra. Paratypes and other specimens are deposited mainly in the BMNH, though in the case of species of which sufficient material is available, some are to be deposited in other institutions, especially the USNM, Washington.

Combinations in this genus are here recorded as new unless known to me to have

been included in a systematic study, although a number have appeared in economic literature.

The ex-Belgian territory in Africa, often referred to as Congo (Kinshasa), is given its current name, Zaire, throughout this paper.

### Genus *PEDIOBIUS* Walker

*Entedon* (*Pediobius*) Walker, 1846 : 184-5. Type-species: *Entedon* (*Pediobius*) *imbreus* Walker, 1846, by subsequent designation (Ashmead, 1904 : 384). [*E. coedicius* Walker, 1846 : 183, designated by Ashmead (1904 : 344), was not originally included explicitly.]

*Pleurotropis* Förster, 1856 : 78, 82. Type-species: *Pleurotropis isomera* Förster, 1861 : 37, by monotypy.

*Pleurotropis* Thomson, 1878 : 239, 248-50. [Not explicitly attributed to Förster. Ashmead (1904 : 386) made an alternative designation as type-species of *Entedon bimaculatus* Dalman, presumably taking the species placed first by Thomson, but this was not originally included by Förster.]

*Pleurotropis* Förster; Waterston, 1915 : 343-5.

*Pediobius* Walker; Ferrière, 1953 : 400.

*Pediobius* Walker; Graham, 1959 : 185-6.

*Pediobius* Walker; Bouček, 1965 : 7-10.

*Pediobius* Walker; Kerrich, 1969 : 215-6.

The above table refers to characterizations of the genus, as distinct from a generic synonymy which has been given by Bouček (1965).

Entedontinae with head, thorax and propodeum strongly sclerotized, so that the head is not normally collapsed in death: gaster very distinctly petiolate, the petiole strongly sclerotized and distinctly sculptured, relatively long in male. Antennae of female about on lower level of eyes. Dorsum of mesothorax very distinctly sculptured, the mesoscutum with no median furrow, with notauli defined, and with a pair of notaular pits at hinder end, shallow and ill-defined to rather deep and more or less well defined, each bearing a main seta. Propodeum (see Plates) having strong plicae laterales and a pair of strong submedian carinae, which diverge from base more or less gently in female, comparatively strongly in male, but which in a very few species are nearly parallel or are coalesced from base to near apex.

The following characters also apply with, in each case, very few exceptions. Occipital carina strong, continuous to below level of top of eyes, the head sharply declived behind it. Sides of upper face distinctly reticulate. Eyes more or less distinctly hairy. Antennae of female having three funicle and two club segments and a terminal spine. Pronotum bearing, in dorsal view, six strong setae, the collar sharply margined, smooth or with sculpture sharply contrasting with that on the rather finely and regularly reticulate anterior part. Notaular pits well separated. Propodeum above, between the carinae, smooth and shining, or with reticulate sculpture very fine and incomplete. First large tergite brightly metallic coloured on about basal half and on sides above, and smooth on this region.

Nearly all species fit one of two alternative venational conditions as stated near the end of this paper.

*P. setigerus* Kerrich, in having the scutellum bearing ten to twelve strong setae on either side, is exceptional among the Entedontinae.

The distribution of this genus is almost world-wide; but it appears that Africa contains the greatest number of species, while very few are known to have been found in the neotropical region.

## AFRICAN SPECIES

*Pediobius ropalidiae* (Risbec) comb. n.

(Pl. 1, fig. 1)

*Pleurotropis ropalidiae* Risbec, 1958 : 68-72, 87-90. Holotype ♀, ZAIRE: Basoko (MRAC, Tervuren).

Bristles on head, thorax and upper surface of pedicellus relatively short and stout, black.

Head, seen from above, broad, about two and a half times breadth of its median length, broadly emarginate in front. Frontovortex about one and a half times breadth of its median length and nearly three times breadth of an eye, with ocelli in about a right-angled triangle; with reticulation rather strongly outstanding but rather fine to only moderately coarse. Sides of upper face scarcely less strongly reticulate: lower face, clypeus and genae very much more weakly but very distinctly reticulate. Eyes very strongly but very sparsely hairy.

Antenna having scape about four, and pedicellus about one and a quarter, times the length of its greatest breadth: funicle almost parallel-sided, the first segment about quadrate, the second and third distinctly transverse, and basal club segment of about the same breadth.

Pronotal collar short, almost covered with extremely fine reticulation, its sides slightly narrowed, emarginate. Notauli deeply impressed anteriorly, leading to notaular pits that are very ill-defined, and bear the main seta rather near the hind margin: sculpture of mesoscutum and scutellum generally rather regular, as on frontovortex but usually a little coarser on mesoscutum and coarser still on scutellum, finer in the notaular pits but sometimes considerably coarser on mid lobe: hind margin weakly sinuate. Propodeum having submedian carinae sub-parallel for much more than half way back, then strongly divergent, rather weak and often comparatively far apart, the surface between and near beside them with very fine reticulation or indication of such, and with no median carina: nucha extremely short, deeply emarginate at apex: spiracles oval, the spiracular area, seen from above, produced into a sharp, jagged tooth above the hind coxa.

Petiolar segment very strongly transverse, about three times as broad as long, finely reticulate, strongly convex in middle and not with strong anterior margin. Remainder of gaster elongate-oval, extremely delicately reticulate on the brown parts, the first large tergite a little more than one-third its length in mature specimens.

Hind tibial spur straight, reaching a little beyond apex of metatarsus.

Head bright blue-green, with frontovortex and sides of upper face often overspread with blue to red-violet, or occasionally with bronzy. Antennae with scape pale testaceous, sometimes darkened above, and pedicellus and flagellum dull brown, with weak metallic reflections. Dorsum of thorax coloured similarly to head: propodeum above with bright, pale brassy reflection: sides of thorax and propodeum a much darker green, with bronzy reflection. Gaster brown, more or less shining, the first large tergite blue-green to blue or red-violet in about basal half, and the hinder tergites often blue-green along their lateral margins. Legs having coxae wholly or partly dark blue-green, beyond that pale testaceous, with only slight metallic darkening on the femora, and the last tarsal segment slightly darkened towards apex.

The gaster is weakly sclerotized, and in semi-teneral female specimens it appears much longer than head, thorax and propodeum combined, but in fully mature specimens it appears slightly shorter.

Redescribed from the following. TANGANYIKA: Tanga, numerous ♀♀, viii-ix.1917 (W. A. Lamborn). MALAWI: Karonga, numerous ♀♀, 1919 (W. A. Lamborn). GHANA: Legon, numerous ♀♀, i.1969 (O. W. Richards). ZAIRE: Basoko, 1 ♀, ii.1949, 'parasite de *Ropalidia guttatipennis*' (P. G. L. Benoit) (paratype); a female paratype recorded as reared from *Belonogaster juncus* Fabricius has also been studied. Males of all series are available.



Further specimens reared by Benoit from both wasp genera have been seen: they are deposited in ORSTOM, Paris and are mounted on four slides.

BIOLOGY (see Richards, 1969). Most of the Lamborn specimens are labelled 'ex Tachinid puparium' and such puparium is included with one series, but others are labelled 'ex Vespidae nest' or 'ex *Belonogaster* nest'. Richards recorded the *Pediobius* as reared from *Anacamptomyia bisetosa* (Roubaud & Villeneuve), a Tachinid parasite of the wasps, and evidently from pupae of *Belonogaster* and *Polistes*, some of which were found with emergence holes of appropriate size. Female *Pediobius* were found sitting in a bloated condition on wholly or partly collapsed eggs of the same wasp genera: we presume they suck the wasp eggs to obtain nourishment for maturing their own.

### *Pediobius rhyssonotus* sp. n.

*Pleurotropis rhyssonotus* Waterston, 1917 MS.

Head, seen from above, rather deeply emarginate in front, nearly 2.5 times breadth of its median length. Frontovertex about one and a quarter times breadth of its median length and nearly twice the breadth of an eye, with ocelli in a very slightly obtuse triangle; with reticulation rather strong and regular, though considerably finer behind. Whole upper face moderately reticulate: lower face, clypeus and genae more weakly and finely so. Eyes rather weakly and moderately densely hairy.

Antenna having scape four times and pedicellus twice length of its greatest breadth: funicle rather strongly broadened in side view, the first segment a quarter longer than broad, the second about quadrate, the third about a quarter broader than long, the segments strongly petiolate at apex.

Pronotal collar with reticulation fine but decidedly outstanding, not at all smooth, its sides strongly rounded, broadened at first then strongly narrowed. Notauli fine, sharply impressed, leading to notaular pits that are of moderate depth but are ill-defined, and bear the main seta nearly half way forward; sculpture of mesoscutum almost entirely strongly outstanding, reticulate behind middle of mid lobe, merging to striate-reticulate elsewhere, the striae tending to be concentric around the mid point of the hind margin, which is very weakly sinuate. Scutellum strongly longitudinally striate, the striae converging to mid point of hind margin, narrowly in mid line much more finely reticulate. Propodeum having submedian carinae diverging gently for most of the way back, then curving strongly outward, with median carina strong in the unique female (though absent in all but one of the male specimens), the whole surface covered with outstanding fine reticulation and rugae, not at all smooth: nucha rather deeply but narrowly emarginate at apex: spiracles small, short-oval, the spiracular area, seen from above, produced into a strong, sharp tooth above the hind coxa.

Petiole segment a little broader than long, covered with outstanding fine reticulation, and with longitudinal ridges rather strong but incomplete. First large tergite about half length of gaster beyond petiole, extremely finely and delicately reticulate almost all over, the following tergites with normal fine reticulation.

Hind tibial spur straight, reaching well beyond apex of metatarsus.

Head and thorax very dark blue-green, with overspread of bronzy, brighter on sides of thorax: propodeum a much brighter blue-green, with pale reflections. Antennae blue-green with bronzy reflections. Gaster brownish black, the first large tergite dark blue-green in about basal half and the last tergite dark blue-green. Legs dark blue-green, the tibiae paler towards apex, the tarsi very pale stramineous, with the apical segment lightly infuscate.

Holotype ♀. UGANDA: Kampala, 'bred from Lymantriid no. 6060', 12.viii.1916 (G. C. Gowdey) (BMNH).

This species has stood in the collection of the British Museum (Natural History) over this manuscript name for over half a century. It is thought well to describe it because of its distinctness. Although, unfortunately, the female specimen is unique in that sex, there are five male specimens, one of them dissected, from the same reared series and exhibiting the same distinctive sculpture. The male specimens have been studied sufficiently to verify the description based on the female.

*Pediobius taylori* sp. n.

(Text-fig. 4)

Head, seen from above, about 2.2 to 2.3 times breadth of its median length. Frontoververtex broader than its median length and about twice breadth of an eye, with ocelli in about an equilateral triangle, the lateral very distinctly more than their longer diameter from orbital and occipital margins; with reticulation of moderate strength and in greater part regular, much more weakly and finely so immediately beside and behind the lateral ocelli but soon merging to more strongly and coarsely so. Sides of upper face rather finely reticulate. Eyes moderately strongly and densely hairy, in facial view strongly convergent below and extending far below level of toruli, the cheeks very sharply narrowed. (Text-fig. 4).

Antenna having scape rather slender, about five times length of its greatest breadth: funicle strongly broadened in side view, the first segment about one and a half times length of its greatest breadth, the second and third moniliform, the second about as long as broad and third about one and a half times as broad as long: basal club a little broader than third funicle segment.

Pronotal collar short, the fore and hind margins almost parallel, the sides rather strongly narrowed. Notauli anteriorly moderately but nowhere sharply impressed: notaular pits rather shallow, not bordered on inner or outer side and bearing the main seta about two-fifths the way forward: mesoscutum having reticulation in greater part of moderate strength and rather regular, though merging to longitudinal between the notaular pits and much finer in them: hind margin moderately sinuate. Scutellum weakly longitudinally striate-reticulate, narrowly in mid line in about anterior two-thirds very weakly longitudinally reticulate to almost smooth. Propodeum having submedian carinae close at base, subparallel or diverging very weakly at first, then diverging much more strongly but at much less than 45°, and with no evident median carina: nucha short, broadly almost truncate at apex: spiracles small, short-oval, more than their longer diameter from margin of metanotum, the spiracular area, seen from above, produced into a small tooth above the hind coxa.

Petiole segment over one and a half times length of its greatest breadth, finely reticulate, with anterior margin narrowly exceptionally strongly raised. Gaster beyond petiole oval, not pointed toward apex, markedly more densely hairy than in *neavei* (Waterston) and *foveolatus* (Crawford): first large tergite much less than half its length, with no more than extremely superficial reticulation near mid apex: following tergites finely but very distinctly reticulate almost throughout, the smooth apical margins very narrow.

Hind tibial spur slightly curved, very strong, extending well beyond middle of second tarsal segment.

Head, seen from above, pale bronzy, dark blue-green beside and behind the lateral ocelli; in facial view dark blue-green to dark blue, the sides of upper face overspread with dark bronzy. Antennae dark blue-green. Pronotum before collar and mesoscutum pale bronzy above merging to blue-green at sides: pronotal collar and scutellum dark blue-green to dark blue or blackish, often with infusion of pale bronzy anteriorly: mesopleura and sides of propodeum



dark blue, with bronzy patch on mesopleura: propodeum above bright blue-green. Gaster dull bronzy to blackish, the first large tergite blue-green to mostly blue in greater part, often almost wholly, and with blue-green coloration on the last two visible tergites. Coxae, trochanters and femora dark blue-green to mostly blue: tibiae mostly a much brighter blue-green: tarsi whitish, with the apical segment infusate.

Rather small species: length about  $1\frac{1}{2}$  mm.

Holotype ♀. UGANDA: Kampala, v.1940, *ex* suspended cocoons of Ichneumonid (*Charops* sp.) *ex* *Metadrepana* sp. (T. H. C. Taylor) (BMNH).

Paratypes. UGANDA: 14 ♀♀, same data as holotype; Kampala, 9 ♀♀, x.1936 '*ex* *Loranthus*, probably primary or secondary parasite of *Mylothris* pupa' (T. H. C. Taylor). One male is present in the first and several in the second series.

Named for the late Dr T. H. C. Taylor, who reared this and numerous other species, and who first suggested that I might study this genus.

### *Pediobius angustifrons* sp. n.

Head, seen from above, rather strongly emarginate in front, over twice breadth of its median length. Frontovortex narrow, its breadth across median ocellus about two-thirds its median length and distinctly less than the breadth of an eye, with ocelli in about an equilateral triangle, the median little more than its own breadth from orbital margin; strongly reticulate, though much more finely so beside and behind the lateral ocelli. Sides of upper face finely reticulate. Eyes extending slightly below level of toruli, strongly and very densely hairy.

Antenna having scape about five times length of its greatest breadth: funicle having first segment about twice length of its greatest breadth and third a little longer than broad, the segments strongly petiolate at apex.

Sides of pronotal collar rather strongly narrowed. Notauli sharply impressed and with sharp anterior margin, which continues as an anterior margin of the sub-triangular notaular pits; these bear deep longitudinal impressions, and the main seta about one-third the way forward, the space between them being much narrower than a pit: mid lobe of mesoscutum with reticulation rather strong, merging to striation between the notaular pits, the parapsides weakly striate-reticulate above, more strongly reticulate at sides, hind margin deeply emarginate in the middle. Scutellum rather strongly and rather coarsely striate-reticulate at sides merging to reticulate, in about hinder half, much more weakly sculptured near mid line in anterior half. Propodeum having submedian carinae sub-parallel or gently divergent some way from base, then curving more strongly outward, and with median carina varying from just indicated to moderately strong: nucha narrowly emarginate at apex: spiracles rather elongate-oval, the spiracular area, seen from above, produced into about a right-angled tooth above the hind coxa.

Petiole segment about a quarter longer than broad, rather finely reticulate, the anterior margin strongly raised in middle. First large tergite a little less than half length of gaster beyond petiole: reticulate sculpture on dark parts of first two large tergites very distinctly outstanding in larger specimens, becoming gradually weaker and finer on hinder tergites.

Hind tibial spur curved, very strong, reaching nearly to apex of second tarsal segment.

Coloration of forms from Kenya, Tanzania and Malawi: head greenish blue, occasionally with red-violet on frontovortex, with considerable overspread of bronzy on upper face, the clypeus blue-green. Antennae blue-green, the pedicellus often darker in part. Thorax and propodeum blue-green to greenish blue, occasionally with red-violet tinge, and with bronzy coloration at sides. Gaster blackish brown, the hinder tergites often with sea-green hind margins, the first large tergite greenish blue, except for a large median apical mark. Legs

blue-green, the tibiae narrowly stramineous at apex, the tarsi stramineous, with only the claws darkened.

Coloration of form from Sierra Leone differs as follows: frontovertex mainly red-violet, thorax and propodeum above usually mainly red-violet, though sometimes the mesoscutum pale bronzy and the pronotal collar and scutellum greenish blue, antennae and legs with red-violet among the green parts. The Uganda specimen also is largely red-violet. The Sierra Leone series is very much the longest available, so it is from this that the holotype is designated.

Holotype ♀. SIERRA LEONE: Njala, 5.x.1929, 'ex larva of ?*Dasychira* sp.' (Lep., Lymantriidae) on *Cola* sp. (*H. Hargreaves*) (BMNH).

Paratypes. SIERRA LEONE: 36 ♀♀, same data as holotype. MALAWI: Namiwawa, 10 ♀♀, 19.iv.1922, ex cocoon mass on unknown caterpillar (*C. Smee*). UGANDA: Kampala, 1 ♀, 4.iii.1924, 'ex cocoon with appendage' (*Apanteles* sp.) (*G. L. R. Hancock*). KENYA: Ruiru, 1 ♀, xii.1965, ex *Apanteles* cocoon from *Ascotis* larva (*D. E. Evans*); Kiambu, 1 ♀, 17.v.1966, 'ex *Odites* pupa' (*O. Andrade*). Males are present in the Sierra Leone and Uganda series.

### *Pediobius neavei* (Waterston) comb. n.

*Pleurotropis neavei* Waterston, 1915 : 345-50, 353, 357, 361. Holotype ♀, MALAWI: Mlanje (BMNH) [examined].

*Pleurotropis neavei* Waterston; Masi, 1940 : 301-3.

Head, seen from above, about 2.3 to 2.6 times breadth of its median length. Frontovertex about as broad as its median length one and a half times to about twice breadth of an eye, with ocelli in a strongly acute to right-angled triangle; strongly reticulate, though more finely so before the median ocellus, and more finely and much more weakly so beside and behind the lateral ocelli. Sides of upper face rather finely to moderately reticulate. Cheeks strongly narrowed. Eyes densely hairy.

Antenna having scape about five times length of its greatest breadth: funicle having first segment about twice length of its greatest breadth and third a little longer than broad, the segments strongly petiolate at apex.

Sides of pronotal collar rather strongly narrowed. Notauli sharply impressed and with sharp anterior margin, which continues as an anterior margin of the broad-oval notaular pits; these bear the main seta nearly half way forward, the space between them being very much narrower than a pit: mid lobe of mesoscutum with reticulation of moderate strength to rather strong and regular, merging to irregular striation between the notaular pits, the parapsides finely to very finely striate: hind margin strongly sinuate. Scutellum strongly and coarsely striate at sides merging to reticulate behind, in middle in about anterior two-thirds much more weakly sculptured, sometimes almost smooth, notably in cotype series. Propodeum having submedian carinae moderately divergent, sometimes comparatively far apart at base, with median carina absent or merely indicated, rarely strong and almost complete as would appear from Terzi's drawing (Waterston, 1915, p. 347): nucha broadly almost truncate or narrowly emarginate at apex: spiracles small, elongate-oval, the spiracular area, seen from above, produced into a small, rather sharp tooth above the hind coxa.

Petiolar segment transverse, very finely reticulate. Gaster beyond petiole relatively elongate and pointed, the first large tergite less than half its length: delicately reticulate on dark part of first large tergite, and much more finely so on following tergites.

Hind tibial spur curved, reaching well beyond apex of metatarsus.

Frontovertex bright blue-green to greenish blue: head otherwise a duller blue-green, with considerable overspread of bronzy. Antennae blue-green, often with weak brassy reflection.

Thorax and propodeum blue-green, often with much bronzy reflection. Gaster dull bronzy, the hinder tergites sometimes with blue-green hind margins, the first large tergite bright blue-green except for a large, median apical mark. Legs blue-green, the tibiae pale at apex, the tarsi stramineous, only slightly darkened towards apex of fourth segment.

In the cotype series the head, notably the frontovertex, is comparatively narrow, with the ocelli in a strongly acute triangle, the scutellum is almost smooth in middle in about anterior two-thirds and the submedian carinae of the propodeum are comparatively far apart at base. The two specimens described by Waterston as a variety of this species, together with the other material now studied, have the head, notably the frontovertex, broader, with the ocelli in a right-angled triangle, the scutellum in middle in about anterior two-thirds much more weakly yet more or less distinctly sculptured, and the submedian carinae of the propodeum often closer at base. There may be a biological difference, since the cotype series was reared from a *Charaxes* pupa whereas the other series were reared from *Apanteles* cocoons, but pending the accumulation of further evidence I prefer to treat all these series studied as belonging to the same species.

In the collection of the British Museum (Natural History) are card mounts of seven ♀♀ out of eight recorded as reared by S. A. Neave, eight slides of parts of the female and six of the male (not recorded). One card-mounted specimen bears a red type label 'TYPE H T' (= holotype), and is evidently an original type-designation. In the collection is also a *Charaxes* pupa bearing the same data and with two holes through which the *Pediobius* presumably emerged: Waterston wrote that the species was 'not improbably a hyperparasite on some species of *Chalcis*' (i.e. *Brachymeria*), but its status remains conjectural.

Further material studied. UGANDA: Bukoba, 2 ♀♀, 10.vi.1912, ex *Apanteles* cocoons (C. C. Gowdey) (each specimen mounted on a card with several cocoons) (this is the original material of *neavei* var. Waterston); Gulu, 13 ♀♀, vii.1936, ex massed cocoons of *Apanteles* from Sphingid larva (T. H. C. Taylor). KENYA: Ruiru, 1 ♀, vi.1966, 'ex sp. A' (O. Andrade). Two males are present in Taylor's series.

***Pediobius foveolatus* (Crawford)**

subsp. ***mediopunctatus*** (Waterston) **comb. et. stat. n.**

(Text-fig. 7)

*Pleurotropis mediopunctatus* Waterston, 1915: 345, 348, 353, 357-60. LECTOTYPE ♀, NIGERIA: Ibadan (BMNH), here designated [examined].

This is treated extensively in the present work among the Asiatic species (pp. 163-165) but is, of course, included also in the key to the African species studied.

Syntype material. NIGERIA: Ibadan, 4 ♀♀, vii.1913, ex pupa of *Epilachna*, s.l., sp. (det. R. D. Pope) (W. A. Lamborn).

The four specimens, one now lacking the gaster, were mounted on a card together with the pupa-case of the host (Text-fig. 7). I select as lectotype the specimen in the top right-hand corner, indicated by an arrow in the artist's drawing. The host pupa-case has subsequently been found to be missing.



*Pediobius setigerus* Kerrich

(Pl. 1, fig. 2)

*Pediobius setigerus* Kerrich, 1970 : 327-8. Holotype ♀, GHANA: Pretsea (BMNH) [examined].  
*Pediobius* sp., 'parasite', Mariau & Morin, 1971 : 86.

Head, seen from above, about two and a quarter to two and a half times breadth of its median length. Frontoververtex about or nearly twice the dorsal breadth of an eye and somewhat broader than its median length, with ocelli in about a right-angled triangle; with reticulate microsculpture in well-developed specimens almost throughout, just clearly distinct  $\times 65$ . Sides of upper face with reticulation very fine, just comfortably distinct  $\times 65$  except above. Eyes extending well below level of toruli, sparsely and very finely hairy ( $\times 100$ ).

Antenna having scape about seven times and pedicellus twice length of its greatest breadth: funicle not broadened in side view, the first segment about one and two-thirds, the third about one and a half times, length of its greatest breadth, the segments clearly narrowing to apex.

Pronotal collar almost parallel-sided, slightly rounded at sides, bearing about sixteen strong setae immediately behind the elevated fore margin and on sides. Notauli rather strongly impressed, running to sub-triangular notaular pits, which bear the main seta near the front and sometimes a subsidiary seta nearer middle: mesoscutum with reticulation rather fine to moderate and with setae stout and rather numerous: hind margin very weakly sinuate. Scutellum about as broad as long, with reticulation weak and rather fine but always quite distinct except near apex, broadly in mid line, merging to much coarser and stronger at sides, and bearing about ten strong setae on either side. Propodeum having submedian carinae rather close together at base, curving gently outward and moderately divergent but at less than  $45^\circ$ , and with at least a slight indication of a median carina: nucha rather short, broadly and weakly emarginate at apex: spiracles small, oval, the spiracular area, seen from above, produced into a tooth or lobe above the hind coxa and with a smaller projection further forward.

Petiolar segment longer than broad, with anterior margin comparatively narrowly raised in middle, rather finely reticulate, with longitudinal ridges at sides but not above. First large tergite generally about two-thirds length of gaster beyond petiole (but the proportion varying considerably), smooth, the following tergites with extremely fine sculpture.

Hind tibial spur short and straight, not reaching apex of the relatively short corresponding metatarsus.

Frontoververtex blue-green, most often merging to dull blue before the ocelli, with a red-violet patch on temples, usually having the inner orbits narrowly bronzy and with a greater or lesser amount of bronzy along occipital margin: upper and lower face blue-green, the upper face overlain with blackish bronzy. Antennae blue-green. Dorsum of thorax and propodeum green, or largely turquoise to ultramarine or red-violet, often with a faint, incomplete, median bronzy stripe on the mesoscutum and/or bronzy in the notaular pits. Gaster bronzy, with first large tergite in usually more than basal half, and last large tergite blue-green, occasionally tinged with red-violet. Legs blue-green, the tibiae paler at extreme base and apex, the tarsi stramineous, with the apical segment and usually the preapical segment at apex lightly infuscate.

Detailed description made from holotype and numerous paratypes: GHANA, IVORY COAST. I do not now believe that the specimen mentioned as having an elongate gaster (Kerrich, 1970) belongs to a different species: several tergites are evidently telescoped out. Variation in relative length of the gaster and proportions of its tergites has also been found in other species.

BIOLOGY. Reared from larvae of the Oil Palm Hispid beetle, *Coelaenomenodera elaidis* Maulik. Almost all accurate records are of this as a primary parasite, though one male specimen was reared as a hyperparasite (see Kerrich, 1970). See also Mariau & Morin (1971 : 86).

*Pediobius acraconae* sp. n.

(Text-figs 1-2)

Head of quite unusual form for this genus, as seen from above (Text-fig. 1) rounded before and behind eyes, and extending some way behind eyes: with ocelli in about an equilateral triangle, and occiput narrow and sloping backward, so that it is clearly visible in this view. Head, seen from above, about 2.4 times breadth of its median length to occipital margin: frontovertex one and a third times this length and two and a half times breadth of an eye. Frontovertex, temples and clypeus shining, in part with extremely fine, irregular sculpture discernible  $\times 65$ : reticulation on occiput rather fine, on sides of upper face moderate to rather fine, merging to very fine below and on the well raised inter-antennal prominence. Eyes sparsely but quite distinctly hairy.

Antenna having scape about four and a half, and pedicellus about two and a half times length of their greatest breadth: first funicle segment about two and a quarter times length of its greatest breadth, almost rectilinearly broadened above and slightly decurved below, the second and third normally slightly longer than broad and slightly broadened, and club about as long as first funicle segment: however, there is irregularity in proportion in different specimens.

Pronotal collar short in mid line but the sides long, broadened, emarginate in middle and doubly rounded. Notauli sharply impressed, continuing as inner margins which extend about half way back round the diagonally-directed, oval notaular pits, these being of moderate depth and bearing the main seta near inner side and about a third the way forward or less: mid lobe of mesoscutum except at sides with sculpture weak and rather fine, concentrically striate-reticulate anteriorly, transversely so in middle and more regularly so behind: reticulation on remainder of scutum much finer, in notaular pits very weak: hind margin evenly curved. Scutellum distinctly broader than its median length and distinctly more convex than mid lobe of scutum, moderately longitudinally striate-reticulate at sides, and with a broad median band, a little broader than the interspace between the notaular pits, shining and smooth or almost so. Propodeum having submedian carinae close at base and gently divergent, fine and weak, sometimes irregular and no stronger than the median carina which may join one of them before base, and having the dorsal surface between the spiracles very finely reticulate to striate-reticulate: nucha prominent, more than half length of the part of the propodeum before it, very finely reticulate but rather shining near mid line: spiracles prominent, oval, more than their longer diameter from margin of metanotum, the spiracular area produced into a small rounded lobe above the hind coxa.

Petiole segment finely and, on hinder half, transversely reticulate; having anterior margin shallow cup-like, not or hardly raised in middle but strongly produced forward at sides, embracing the nucha; behind this marginal part moderately expanded to apex, the median length of the segment a little less than its least breadth. Remainder of gaster (Text-fig. 2) very elongate, much longer than head, thorax and propodeum combined; the first large tergite bulbous, those following narrowed, the second almost or quite covered above though clearly visible at sides and below, the following much more elongate, the first five strongly overlapping their opposite sides beneath, those beyond the third moderately densely beset with semi-decumbent pubescence.

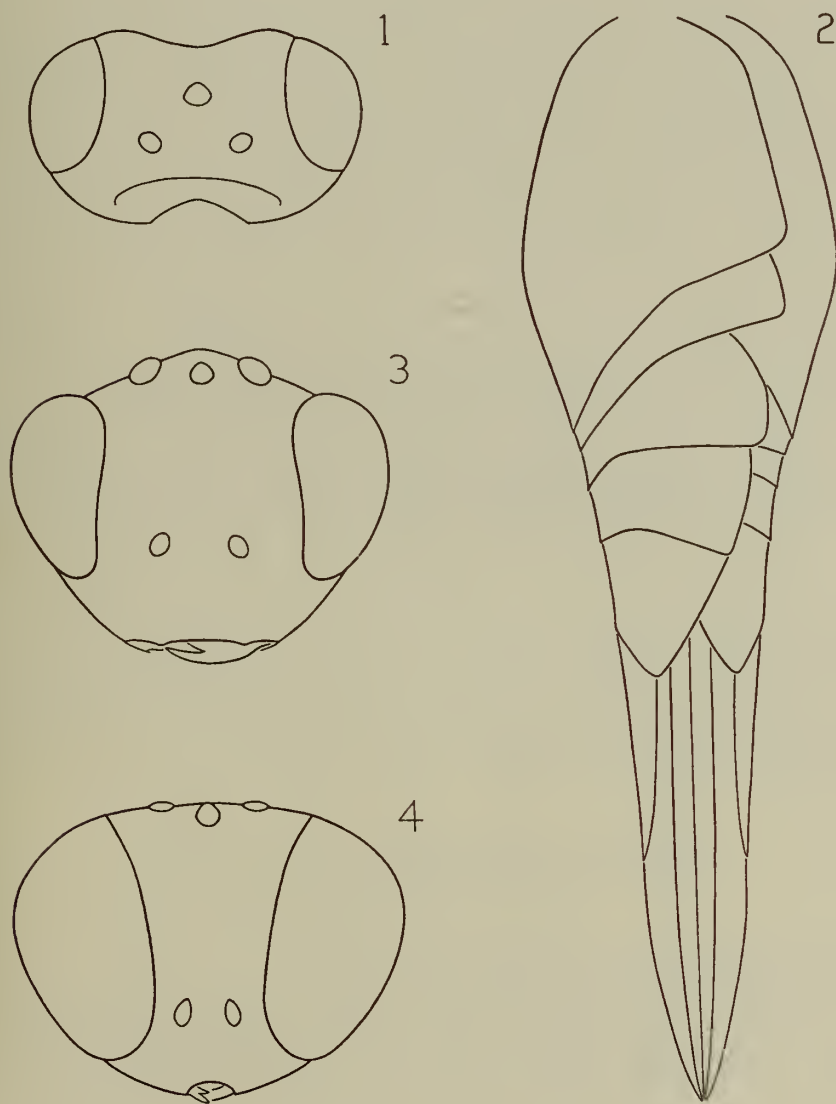
Fore wings slender, about three times length of their greatest breadth, when folded back about reaching apex of penultimate large tergite. Legs exceptionally slender, the hind femur over five times length of its greatest breadth, the hind tibial spur about three-fifths length of corresponding metatarsus.

Frontovertex and occiput shining blackish: upper face dark bronzy, merging to dark blue-green on genae, lower face and clypeus. Antennae pale brown to blackish brown, with weak metallic reflection: the specimens with paler antennae perhaps to some extent teneral. Thorax and propodeum shining blackish, the propodeum sometimes with infusion of blue-green or bronzy. Gaster shining blackish. Legs with coxae brownish black to blackish brown, becoming gradually paler to the tarsi, which are pale testaceous except at apex.



*Male* differs as follows—head, seen from above, only a little narrowed behind eyes, the eyes relatively small and the occiput relatively broader than in female, and the ocelli in an obtuse triangle. Head, seen from above, three times breadth of its median length to occipital margin: frontoververtex twice this length and four times the breadth of an eye.

Antenna having scape about two and three-quarter and pedicellus one and a half times length of their greatest breadth: funicle 2-segmented, the first almost parallel-sided and nearly



FIGS 1-4. 1-2. *P. acraconae* sp. n. 1. Head, seen from above; 2, gaster in ventral view. 3-4. Head in facial view of 3, *P. clinognathus* (Waterston) and 4, *P. taylori* sp. n.

three times as long as broad, the second decidedly broadened, scarcely longer than its greatest breadth, and club very much broader than second funicle segment, almost circular in outline.

Propodeum having nucha relatively rather shorter: spiracles short-oval, about their longer diameter from margin of metanotum.

Petiole segment with reticulation not evidently transverse; produced forward medially into a smooth neck which articulates with the nucha; having anterior angles not especially prominent, the sides margined and moderately rounded, the reticulate part over one and a half times breadth of its median length. Remainder of gaster a little longer than head, thorax and propodeum, not of normal masculine form for the genus but triangularly narrowed beyond the first large tergite, which is expanded and only slightly rounded at sides; beyond the third large tergite sparsely beset with strong, almost erect, setae. Micropterous, the wings relatively strongly hairy, the fore wings about three times length of their greatest breadth, when folded back reaching about to apex of first large tergite. Legs comparatively stout, the hind femur hardly three and a half times length of its greatest breadth, the hind tarsus short, not much more than half length of the corresponding tibia, the hind tibial spur strongly curved and far overreaching the corresponding metatarsus, which is distinctly shorter than the second tarsal segment.

Upper and lower face purplish bronzy. Legs markedly darker than in the female, especially the tarsi.

Holotype ♀. NIGERIA: Ibadan, 17.ii.1961, *ex* larva of *Acracoma remipedalis* Karsch (Pyrilidae, Galleriinae) in ants' nest (*L. A. Mound*) (BMNH).

Paratypes. 6 ♀♀, 2 ♂♂ (including allotype), same data as holotype.

BIOLOGY (see Mound, 1962). The above-cited specimens, with others, had emerged from a last instar larva of the host in the ants' nest. This is a hard nest of a species of *Crematogaster* determined as ? *depressa* Latreille: the ant material cannot be traced at this time but Mr B. Bolton, who has studied ants in that area, informs me that it would probably have been either *depressa* Latreille or *africana* Mayr. The nomenclature of the commensal was rectified by Whalley (1962). I am quoted by Mound as writing of the parasites 'The males are micropterous, the aedeagus protruding, which suggests that they may mate with their sisters and never escape from the ants' nest.' The small size of the eyes and the strong, presumably sensory, setae on the hinder tergites would support this suggestion.

The species looks so very unlike an ordinary *Pediobius* that I did not recognize it as belonging to this genus in 1961.

### *Pediobius aspidomorphae* (Girault) **comb. n.**

(Pl. 5, fig. 9; Text-figs 5, 6)

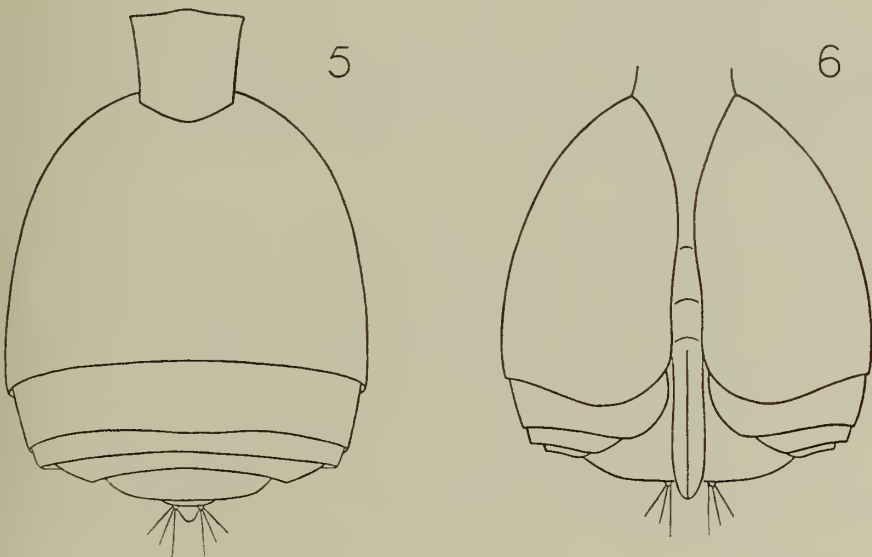
*Pseudacrias aspidomorphae* Girault, 1938 : 75. Syntypes, ♀ recorded as ♂, AUSTRALIA: Queensland, Brisbane (Queensland Museum, Brisbane).

Head very broad, about two and three-quarters times breadth of its median length. Fronto-vertex two and two-thirds times the dorsal breadth of an eye and more than one and a half times breadth of its median length, with ocelli in a right-angled or slightly obtuse triangle; in greater part in Kenya series rather dull, finely and weakly reticulate, though the reticulation distinct  $\times 45$ , but beside the lateral ocelli shining, with sculpture very much weaker: smaller specimens have the reticulation mostly rather indistinct, though often much more distinct on inter-ocellar area. Sides of upper face rather weakly reticulate, becoming more coarsely so towards mid-line. Eyes with pilosity rather sparse but of moderate strength.

Antenna in Kenya series having scape slender, about seven times length of its greatest breadth, yet not nearly reaching the median ocellus: funicle slightly broadened in side view, the first segment about one and a half times length of its greatest breadth, the third nearly as broad as long, the segments distinctly petiolate at apex, relatively sparsely beset with outstanding hairs: in the smaller specimens of the other series the flagellar segments are relatively somewhat shorter.

Pronotal collar short, bearing extremely fine reticulation just discernible  $\times 65$ , its sides moderately to rather strongly narrowed. Notauli finely and sharply impressed: notaular pits rather well-defined, sub-triangular, more or less finely but distinctly reticulate, and bearing the main seta rather near inner side: reticulation on mesoscutum strongly outstanding, finer anteriorly before the notauli, merging to much coarser in middle and behind, sometimes striate-reticulate between the notaular pits: hind margin gently curved, very weakly sinuate in middle. In the Uganda series the notaular pits are less well defined but very deeply impressed. Scutellum rather strongly convex, having reticulation coarse or rather coarse and strongly outstanding, in greater part longitudinal though more rounded posteriorly and sometimes in middle, and finer anteriorly in mid-line: smooth or almost smooth at mid-apex. Propodeum having submedian carinae diverging gently and with a median carina or trace of such; the median area with a well-marked pair of cavities before the nucha, which is weakly emarginate at apex: spiracles short-oval, small, much more than their longer diameter from margin of metanotum, the spiracular area, seen from above, produced into a strong, sharp tooth above the hind coxa.

Petiolar segment a little longer than its basal breadth and markedly narrowed from base, with anterior margin strongly raised, rather finely and, for this structure, comparatively outstandingly reticulate, without or with merest indications of longitudinal ridges above. Female gaster (Text-figs 5-6) not, as in most species, gradually more or less pointed but of masculine form, very broadly rounded at apex, apart from the ovipositor sheaths and with epipleura that almost or quite meet mid-ventrally for a considerable length. First large tergite about two-thirds length of gaster beyond petiole, with sculpture on the bronzy part often not



FIGS 5-6. Gaster of *P. aspidomorphae* (Girault), 5, seen from above and 6, in ventral view.

distinct  $\times 100$ : reticulation on second large tergite delicate but quite distinct, and on the following tergites extremely fine.

Hind tibial spur almost straight, reaching well beyond apex of metatarsus.

Head dark blue-green to blackish blue, often with overspread of bronzy and sometimes red-violet. Antennae blue-green to blue. Thorax and propodeum blue-green, the sides darker, the thoracic dorsum to a lesser or greater extent overspread with bronzy, in the Uganda series mainly bronzy, even including the pronotal collar. Gaster dull bronzy, the first large tergite blue-green, sometimes tinged with red-violet, in about basal two-thirds or more, sometimes almost wholly bright coloured, with only a rather large, median apical mark bronzy. Legs dark green, the tibiae sometimes pale at extreme apex, the tarsi stramineous, with the apical segment pale brown.

Redescribed from the following. SULAWESI (= Celebes): Macassar, 4 ♀♀, 1959, *ex pupa Aspidomorpha miliaris* Fabricius (Col., Cassididae) (*J. M. Hutagalung*), (det. A. B. Gahan and B. D. Burks). KENYA: Ruiru, 4 ♀♀, 16.xii.1954, 3 ♀♀, 11.i.1955 *ex pupa Aspidomorpha parummaculata* Boheman (*D. J. McCrae*); UGANDA: Kampala, 16 ♀♀, xi.1929, 'ex Cassid pupa on sweet potato' (*H. Hargreaves*). TANZANIA: Amani, 35 ♀♀, 8.xii.1921, *ex Cassidid* on sweet potato (*A. H. Ritchie*). Males are present in all but the Uganda series and are copper-coloured.

This species was first drawn to my attention by Dr Burks, who organized the loan of the Macassar series. Simultaneous study of the African series satisfied me that I could regard them as belonging to the same species.

Dr Burks informed me that he and Mr Gahan had not seen the Australian types but had made the determination from literature. The most useful character mentioned in Girault's paper appears to me to be the host-record: Dr E. F. Riek informed me that the 'revised tables' referred to are almost certainly his manuscript notes to the family, which were completed in 1934 but not published.

I wished to have the identity of the species confirmed and also the sex of the type material checked, suspecting that Girault had mistaken this, since all male specimens available to me are copper-coloured. Accordingly I sent a copy of the above redescription, tracings of my figures of the female gaster, and 3 ♀♀, 2 ♂♂ from the Tanzanian series for deposit in the Australian National Collection. Dr Riek visited Brisbane and kindly replied as follows:

'I have examined the types of *Pediobius aspidomorphae*. There are two slide-mounted specimens. The two, crushed, bodies are on one slide and the heads and antennae on another. The slides are poor, with the bodies crushed and opaque. I can just distinguish that one body is that of a female. This is the slightly larger specimen. I think that the other one is probably also a female. The gaster is abbreviated at apex and of male form in both specimens. That of the larger specimen is about as large as the thorax.

'The only character that does not seem to fit is the petiole which is slightly wider than long (measurements taken over the narrowest parts). This may be due to some compression particularly as the thorax is crushed although I do not think that this is so.'

The European *P. epeus* (Walker) has the female gaster of the same form as in this species. The type, which I have examined, agrees with *aspidomorphae* in



having the sculpture of the mesoscutum reticulate and strongly outstanding, though considerably less coarse. It differs notably as follows: pronotal collar rather long, little narrowed at sides: scutellum of normal convexity for the genus, finely longitudinally striate with weak inter-connecting ridges, the sculpture weaker in mid line: propodeum having submedian carinae adjacent at base, diverging slightly to about half way back, then at about  $45^\circ$  (Bouček, 1965, fig. 11, p. 21). Bouček compares *P. ulmi* (Erdős) with *epeus*, stating that in that species the smooth area of the scutellum extends forward in mid line.

The North American *P. lonchaeae* Burks, which has the same form of female gaster, shows much affinity with *epeus* in the above respects. However, the sculpture of the mesoscutum is coarser, more like that of *aspidomorphae*, and the propodeum has the submedian carinae well separated at base. The scutellum is relatively broader and a little flatter than in *epeus*; it has the sculpture rather strongly outstanding, mainly longitudinally striate in about basal half merging to slightly longitudinally reticulate, smooth behind (Burks, 1966, fig. 4, p. 38). The anterior angles of the mesoscutum are very prominent. I have examined a pair of paratypes.

### *Pediobius marjoriae* sp. n.

Head very broad, three times breadth of its median length, scarcely emarginate in front but broadly and rather deeply so behind. Frontoververtex about two and two-thirds times the dorsal breadth of an eye and about 1.8 times breadth of its median length, with ocelli in a very obtuse triangle, the lateral about one and a half times their diameter from orbital margin. Head shining all over, without distinct sculpture even on sides of upper face. Eyes not distinctly hairy ( $\times 100$ ).

Antenna having scape narrow, very little expanded in middle, about seven times length of its greatest breadth, but pedicellus rather swollen, twice length of its greatest breadth: funicle not broadened in side view, the first segment over, the third normally nearly twice length of its greatest breadth, the segments strongly petiolate at apex, relatively sparsely beset with outstanding hairs, that mostly are much longer than the breadth of the segment that bears them.

Pronotal collar having sides distinctly broadened, weakly emarginate. Notauli moderately deeply impressed anteriorly then very weakly so: notaular pits shallow, scarcely defined, bearing the main seta about half way forward: mesoscutum having reticulation wide-meshed in middle, less so at sides, tending to be longitudinal behind the middle, and very fine in the notaular pits: hind margin scarcely sinuate. Scutellum rather strongly convex, strongly longitudinally striate anteriorly, merging to reticulate in about hinder half, the bristles comparatively short, evidently shorter than the part behind them. Propodeum having submedian carinae almost straight and gently divergent in greatest part, more strongly so near apex but at much less than  $45^\circ$ , and without or with only a trace of a median carina: nucha sharply margined at sides, moderately emarginate at apex: spiracles small, very short-oval, the spiracular area, seen from above, produced into a small tooth above the hind coxa.

Petiolear segment about one and a half times as broad basally as long, with anterior margin only moderately raised in middle, finely reticulate behind, more coarsely and irregularly so and with some short longitudinal ridges anteriorly. Gaster beyond petiole pointed, sometimes strongly so, the first large tergite usually somewhat less than half its length, almost smooth above, the following very finely reticulate to trans-striate, the pilosity comparatively long and sparse.



Fore wing trichiation dense. Hind tibial spur straight, not nearly reaching apex of corresponding metatarsus, which is relatively elongate.

Frontovertex and hinder genae blue-black with weak, brighter reflection: upper and lower face and clypeus blue-green, with strong coppery to bright brassy reflection. Antennae having scape stramineous, with very weak metallic reflection, and pedicellus and flagellum bright coppery to bronzy. Thorax in greater part and sides of propodeum a very dull green over-spread with blackish, but propleura and an upper longitudinal streak on mesopleura a moderately bright green. Gaster dark bronzy, the first large tergite blue-green in about basal two-thirds or more. Legs blue-green, the coxae often darker at base, the femora and tibiae often with dull brassy to bronzy reflection, the tibiae pale at extreme apex, the tarsi pale stramineous, with the apical segment slightly darkened.

Holotype ♀. UGANDA: Moniko, vii.1941, 'primary ex cocoon of ant (? *Acantholepis* sp.)' (T. H. C. Taylor) (BMNH).

Paratypes. UGANDA: 11 ♀♀, same data as holotype. No males are present in the series.

Named for my wife in thankfulness for her unfailing interest and support.

### *Pediobius coffeicola* (Ferrière)

(Pl. 2, fig. 3)

*Pleurotropis coffeicola* Ferrière, 1936 : 483-4, 489-91. Holotype ♀, TANZANIA: Arusha (BMNH) [examined].

*Pleurotropis coffeicola* Ferrière; Masi, 1940 : 301-3.

*Pediobius coffeicola* Ferrière; Kerrich, 1970 : 328-9.

Head, seen from above, about two and a half times breadth of its median length. Frontovertex about or nearly twice the dorsal breadth of an eye and about as broad as to one-quarter broader than its median length, with ocelli in about a right-angled triangle; with reticulate microsculpture in well-developed specimens almost throughout, just clearly distinct  $\times 65$ . Sides of upper face finely reticulate. Eyes extending well below level of toruli, sparsely and finely hairy ( $\times 65$ ).

Antenna having scape about five and pedicellus about one and a half times length of its greatest breadth: flagellum in coffee-associated form slightly broadened in side view, the first segment about one and a third times length of its greatest breadth and third slightly longer than broad, the segments shortly petiolate at apex; but in oil palm associated form relatively slender, with the segments longer petiolate.

Pronotum having lateral angles prominent, as in *saulius* (Walker) (Bouček, 1965, pp. 35-36), the collar strongly contracted and rounded at sides behind its sharp anterior margin, weakly longitudinally striate in middle. Notauli strongly impressed anteriorly: notaular pits bearing a deep longitudinal impression, having a very sharp anterior margin and bearing the main seta near inner corner almost immediately behind this margin: mid lobe of mesoscutum anteriorly moderately to rather coarsely reticulate, merging to moderately to very strongly striate between the notaular pits, the parapsides finely concentrically striate; hind margin rather weakly to moderately sinuate. Scutellum regularly, moderately to rather strongly longitudinally striate, the striation merging to reticulation shortly before the smooth apical margin. Propodeum having submedian carinae well separated at base, curving inward very briefly and then curving outward, diverging at about or less, sometimes much less, than  $45^\circ$  and seldom with any indication of a median carina; nucha short, almost truncate at apex: spiracles very small, oval, the spiracular area, seen from above, weakly and bluntly produced above the hind coxa.

Petiole segment broader at base than long, with anterior margin strongly raised in middle, finely reticulate, with longitudinal ridges present at sides but absent or very weak and incomplete above. First large tergite about half length of gaster beyond petiole, with very slight surface irregularity on the bronzy part, the following tergites very finely to extremely finely reticulate, with the apical margins smooth.

Hind tibial spur short and almost straight, not or hardly reaching apex of corresponding metatarsus.

Frontovertex medium green, often merging before ocelli to royal blue or red-violet, or sometimes a very dark green to steely blue, with bronzy extending from upper face: lower face dull green to steely blue and upper face bronzy. Antennae blue-green. Thorax and propodeum medium green to blue-green, sometimes merging to blue or red-violet, the thorax often infused to a very varying extent with bronzy, sometimes very largely bronzy. Gaster dull bronzy, the first large tergite blue-green, sometimes tinged with red-violet, in about basal half or more extensively, often almost wholly so except for a large median mark in about apical half, the following tergites mostly with narrow, blue-green apical margins and sometimes tinged blue-green at sides. Legs dark blue-green, the hind coxae sometimes almost black, the tarsi stramineous, with the apical segment fuscous.

Material studied. TANZANIA, UGANDA, KENYA, holotype and numerous paratypes *ex Leucoptera* spp. mining in coffee (see Ferrière, 1936). KENYA, Kiambu, 1 ♀, 16.ix.1953, *ex Leucoptera coffeina* Washbourn (*D. J. McCrae*). GHANA, IVORY COAST: ♀♀, *ex Coelaenomenodera elaidis* Maulik (Hispidae) on oil palm (see Kerrich, 1970); ZAIRE: Nioka, ♀, 1934 (*J. V. Leroy*).

BIOLOGY. Reared both as primary and hyperparasite of lepidopterous leaf-miners in coffee in East Africa and of the Hispid leaf-miner in oil palm in West Africa (see Kerrich, 1970). See also Le Pelley (1968).

### *Pediobius clinognathus* (Waterston) **comb. n.**

(Pl. 2, fig. 4; Text-fig. 3)

*Pleurotropis clinognathus* Waterston, 1915 : 345, 348, 350-3, 357. LECTOTYPE ♀, NIGERIA: Ibadan (BMNH), here designated [examined].

*Pleurotropis clinognathus* Waterston; Masi, 1940 : 301-2.

*Pleurotropis macrognathus* Risbec, 1958 : 68, 72-5. Holotype ♀, ZAIRE: Haut Uele, Paulis (MRAC, Tervuren). **Syn. n.**

Head, seen from above, rather deeply emarginate in front and behind, thus over two and a half to nearly three times breadth of its median length. Frontovertex twice or nearly twice the dorsal breadth of an eye and one and a quarter to nearly one and a half times breadth of its median length, with ocelli in about a right-angled or very slightly obtuse triangle: with microsculpture distinct  $\times 45$  almost throughout, in a regular reticulation on inter-ocellar area but otherwise irregular. Sides of upper face rather finely reticulate, the pattern transverse in part; lower face and clypeus uncommonly broad and flat for the genus (Text-fig. 3), markedly shining. Eyes in facial view very weakly emarginate, extending a little below level of toruli, coarsely and rather densely hairy. Mandibles elongate, sickle-shaped, with the lower tooth much longer and stronger than the upper (Waterston, 1915, fig. 5e).

Antenna (Waterston, 1915, fig. 2d) having scape about six times and pedicellus twice length of its greatest breadth: flagellum not broadened in side view, the first segment nearly twice length of its greatest breadth, the third a little longer than broad, the segments shortly but distinctly petiolate at apex [the representation in Risbec's figures should be ignored].

Pronotal collar almost parallel-sided, bearing some very weak reticulation behind its weak anterior margin, its posterior margin more deeply emarginate in front of mid lobe of mesoscutum. Notauli sharply impressed: notaular pits rather shallow but very conspicuous, margined anteriorly by sharp continuations of the notauli and on inner side by converging striae, which leave a comparatively narrow separation before the scutellum, bearing the main seta about two-fifths the way forward and at a greater distance from the inner margin: reticulation rather coarse on mid lobe of mesoscutum anteriorly and on parapsides, merging to longitudinal striation, the sculpture weaker in the notaular pits: hind margin rather strongly sinuate. Scutellum longitudinally elongate-reticulate. Propodeum (Waterston, 1915, fig. 3), having submedian carinae rather close together at base, diverging weakly and almost rectilinearly in more than basal half, then more strongly but at much less than  $45^\circ$ , and with some indication of a median carina: nucha narrowly and deeply emarginate at apex: spiracles sub-circular, about twice their own diameter from margin of metanotum, the spiracular area, seen from above, produced into a large rounded lobe above the hind coxa.

Petiolar segment much broader at base than long, with anterior margin hardly raised, very finely reticulate, with longitudinal ridges above and at sides weak and incomplete. Remainder of gaster very short-oval, much shorter than thorax plus propodeum and not greatly longer than broad: first large tergite rather over half its length, almost smooth, the following tergites very finely to extremely finely reticulate.

Hind tibial spur straight, not reaching apex of corresponding metatarsus.

Frontovertex sea-green, merging to red-violet: upper and lower face dark blue-green, the upper face in greater or lesser part bronzy. Antennae testaceous, with some metallic green darkening on scape, and pedicellus and flagellum largely metallic green, especially above. Pronotal collar, scutellum and propodeum mainly dark blue-green to blue: mesoscutum dark blue-green, mainly overlaid with bronzy. Gaster dull bronzy, the first large tergite wholly or mainly blue-green and red-violet. Legs having coxae, trochanters and femora mainly blue-green, the trochanterelli paler, the tibiae testaceous to dull stramineous, with slight metallic green darkening on fore and mid tibiae above, and more on hind tibiae, the tarsi dull stramineous, with only the extreme apex infusate.

Redescribed from the following. GHANA: Aburi, numerous ♀♀, 1912-13, *ex Synagris cornuta* Fabricius (W. A. Patterson) ('paratypes'). NIGERIA: Ibadan, numerous ♀♀, em. 2.ii.1914 (W. A. Lamborn) (syntypes). ZAIRE: Haut Uele, Paulis, 2 ♀♀, vii.1947 (P. G. L. Benoit) (paratypes of *macrognathus* Risbec). From among the female syntypes from Ibadan, one specimen is here selected as lectotype and has been so labelled.

*P. clinognathus* Waterston has been separated from other African species in dichotomous keys upon the form of the mandibles and the brownish tint of the wings, whereas Risbec separated *macrognathus* upon a rosy wing tint. In fact the brownish tint is very faint, and the rosy and other interference colours can be seen in the Waterston specimens by viewing them at the appropriate angle.

Risbec stated that the holotype, allotype and paratypes were in the Musée Royal, Tervuren, but did not cite any male specimen. Dr J. Decelle has accounted for all specimens except three, which Risbec may have retained, and informs me by letter that all are female, so no Risbec allotype may exist.

Dr P. G. L. Benoit is unable, at this time, to trace his records from that date: it may be presumed that his twenty specimens were either reared from the nest of a social wasp or taken on the windows of a house, under the eaves of which such a wasp was nesting.



*Pediobius arcuatus* sp. n.

Head, seen from above, rather deeply emarginate in front and deeply so behind, about three times breadth of its median length which in consequence is relatively short. Frontovortex about one and a half times breadth of its median length and twice or more the dorsal breadth of an eye, with ocelli in about or, more usually less than, a right-angled triangle, relatively large, the lateral little more than their own diameter from orbital margin. Frontovortex having, on inter-ocular area, reticulation that is very fine but dense and distinct, elsewhere shining, with sculpture indistinct; delimited from upper face by a sharp transverse carina, which is much nearer the median ocellus than the length of that ocellus, and which does not quite reach the eyes. Upper face shining and with sculpture indistinct above the frontal fork, the arms of which converge at about a right, or only slightly obtuse, angle, at sides rather finely and for the most part decidedly transversely reticulate. Eyes rather strongly and moderately densely hairy.

Antenna having scape five times and pedicellus over twice length of its greatest breadth: funicle distinctly broadened in side view, the first segment nearly twice length of its greatest breadth, the third one-fifth longer than its greatest breadth, the segments shortly petiolate at apex: club excluding terminal spine equal in length to first funicle segment.

Pronotal collar having sides slightly narrowed and sharply emarginate. Notauli fine, sharply impressed, running to notaular pits that are of moderate depth but not sharply defined, and which bear the main seta less than a third the way forward: mesoscutum with a more or less developed median longitudinal impression in about hinder half: mesoscutum having reticulation irregular, varying from moderately wide-meshed, especially on about middle of mid lobe, to very fine: hind margin weakly sinuate. Scutellum shining, finely longitudinally striate almost throughout, not clearly more weakly so in mid line. Propodeum having submedian carinae strongly raised basally, bowed inward to middle then outward again, diverging behind at about  $45^\circ$ , and without or with only a trace of a median carina; not quite smooth dorsally but in large part with indefinite sculpture visible  $\times 65$ : nucha rather large, having carinae that are irregular but often of moderate strength, rather deeply emarginate at apex: spiracles elongate-oval, the spiracular area, seen from above, produced into a sharp or very sharp tooth above the hind coxa.

Petiole segment about one and a half times as broad basally as long, with anterior margin very little raised, strongly decurved in side view, rather finely reticulate, longitudinally keeled at sides but not above. Gaster beyond petiole relatively elongate and pointed, the first large tergite somewhat less than half its length, almost smooth above, the second to fourth delicately and finely reticulate with broad, smooth margins, the following finely reticulate to trans-striate, the pilosity relatively strong and outstanding.

Basalis of fore wing bearing several hairs, usually arranged in two rows. Hind tibial spur slightly curved, extending to or only just beyond apex of corresponding metatarsus.

Head blue-green, with brassy to bronzy reflection, in part blue-black, especially on fronto-vertex and malar region. Antennae having scape stramineous, and pedicellus and flagellum dull blue-green, the pedicellus pale beneath. Thorax and sides of propodeum very dull green, with infusion of blue-black. Propodeum above bright blue-green, with infusion of royal blue to red-violet. Gaster very dark bronzy, the first large tergite in more than basal half strongly blue-green, usually with infusion of blue and red-violet. Legs blue-green to dull blue, the femora pale at extreme apex, the tibiae and tarsi pale testaceous to dull stramineous, the tarsi hardly darkened at apex.

Holotype ♀. UGANDA: Kawanda, ix.1942, 'secondary *ex* cocoons under *Dasychira goodii* Holland on *Ficus*' (T. H. C. Taylor) (BMNH).

Paratypes. UGANDA, 10 ♀♀, same data as holotype. No males are present in the series.

*Pediobius homoeus* (Waterston) **comb. n.**

*Pleurotropis homoea* Waterston, 1915 : 345-6, 353, 356-8. LECTOTYPE ♀, MALAWI: Zomba (BMNH), here designated [examined].

*Pleurotropis homoea* Waterston; Masi, 1940 : 301-3.

Head, seen from above, about 2.3 times breadth of its median length. Frontoververtex about twice the dorsal breadth of an eye and one-third broader than its median length, with ocelli in a very distinctly acute triangle: weakly reticulate throughout, but the reticulation distinct  $\times 45$ . Sides of upper face moderately reticulate. Eyes rather sparsely and obscurely hairy.

Antenna (Waterston, 1915, fig. 2f) having scape about four times length of its greatest breadth: funicle strongly broadened in side view, the first segment about one and three-quarter times length of its greatest breadth, the second a little longer than broad, the third distinctly broader than long, and club distinctly broader than the third funicle segment.

Pronotal collar weakly rounded at sides; not quite smooth, but with sculpture very weak and indefinite. Notauli sharply impressed and moderately strong, running to the notaular pits which are ill-defined and rather shallow, and bear the main seta about one-third the way forward: mesoscutum finely transversely reticulate anteriorly, merging to finely longitudinally striate-reticulate between the notaular pits, more strongly reticulate in and beside them: hind margin moderately sinuate. Scutellum longitudinally striate-reticulate at sides, merging to reticulate behind, having a median band of moderate breadth finely but very distinctly reticulate, (*pace* Waterston) not smooth, but the sculpture greatly exaggerated in Terzi's drawing. Propodeum (Waterston, 1915, fig. 10) having submedian carinae straight and gently divergent in greater part, more strongly divergent but at much less than  $45^\circ$  in about apical third, and with a median carina or strong indication of such; not quite smooth dorsally but with indefinite sculpture obvious  $\times 65$  and with very fine reticulation within the median area: nucha rather large, having sharp carinae running back from the submedian carinae, rather deeply emarginate at apex: spiracles elongate-oval, the spiracular area, seen from above, produced into a very sharp tooth above the hind coxa.

Petiolar segment a little longer than its breadth at extreme base, finely reticulate, with longitudinal ridges of moderate strength but irregular and incomplete. Gaster beyond petiole rather broad oval, the first large tergite about two-thirds its length, delicately reticulate on the bronzy part, the following tergites very finely reticulate to trans-striate.

Hind tibial spur curved, extending well beyond apex of corresponding metatarsus.

Head dark blue-green to blackish blue with some brighter reflection, the upper face more bronzy. Antennae blue-green. Mesothorax dark blue-green with some brighter reflection, the pleura and also sides of propodeum in large part bronzy: propodeum above and pronotal collar a much brighter green. Gaster bronzy, the first large tergite blue-green in about basal three-fifths. Legs dark blue-green, the tarsi stramineous with the apical segment fuscous.

The species was described from a series of 10 ♀♀, 2 ♂♂, from MALAWI, Zomba, reared from the stalk-borer *Busseola fusca* Hampson by E. Ballard. I have not determined any reared series of this species during my service with the Commonwealth Institute of Entomology, although I have received *P. furvum* (Gahan) reared from *Busseola* and other stalk-borers many times.

In the collection of the British Museum (Natural History) are card mounts of seven ♀♀, two lacking the head, and one ♂, five slides of dissections of the ♀ and two of the ♂. I select as lectotype an undamaged female specimen mounted half on its side, on which the dorsal and left lateral surfaces can be well, and the facial and ventral surfaces fairly well, seen. The remaining specimens are paratypes. The above redescription has been made from the lectotype and card-mounted paratypes.



Despite Waterston's key character and description, I find the mid anterior region of the scutellum not smooth, but to have the reticulation, though very decidedly finer, distinctly raised.

***Pediobius anastati* (Crawford) comb. n.**

(Pl. 3, fig. 5)

*Pleurotropis anastati* Crawford, 1913 : 254-5. Holotype ♀, MALI: Koulikoro (USNM, Washington).

*Pleurotropis violaceus* Waterston, 1915 : 345, 362. Holotype ♂, MALAWI: Zomba (BMNH) [examined]. **Syn. n.**

Head considerably broader than thorax, comparatively strongly emarginate in front, hence about three times breadth of its median length. Frontovortex more than twice the dorsal breadth of an eye and about twice breadth of its median length, comparatively strongly emarginate in front, with ocelli in a very distinctly obtuse triangle; finely reticulate, the meshes becoming transverse before the ocelli. Reticulation on sides of upper face rather fine. Eyes very sparsely and obscurely hairy.

Antenna having scape about three and a half times length of its greatest breadth: funicle strongly broadened in side view, the first segment a little longer than broad, the second and third strongly transverse, the segments strongly petiolate at apex, and club a little broader than the third funicle segment.

Pronotal collar almost straight-sided, with hind margin rather deeply emarginate and consequently relatively short in mid line, finely but very distinctly reticulate. Notauli moderately impressed anteriorly but obscure behind this: notaular pits shallow and ill-defined, bearing the main seta about one-third the way forward: mesoscutum regularly and finely reticulate: hind margin weakly to moderately sinuate. Scutellum longitudinally reticulate or striate-reticulate, merging to longitudinally reticulate behind; having a median band of moderate breadth finely reticulate, but the sculpture very distinct throughout. Propodeum having submedian carinae curving gently outward and with a fine median carina: nucha short, rather deeply emarginate at apex: spiracles short to moderately elongate-oval, the spiracular area, which bears very fine reticulation, produced into about a right-angled tooth above the hind coxa.

Petiole segment transverse, very finely reticulate, with rather weak longitudinal ridges at sides but not above. Gaster beyond petiole broad-oval, the first large tergite just over half its length, with median reticulation on apical half extremely delicate, just comfortably discernible  $\times 65$ , the following tergites very finely reticulate, with smooth apical margins.

Hind tibial spur strongly curved, extending to about middle of second tarsal segment.

Frontovortex blue-green: upper and lower face brassy green. Antennae blue-green, with some brassy to bronzy reflections on the flagellum. Thorax dull green, more or less overspread with dull bronzy: propodeum a brighter blue-green. First large tergite blackish brown, with a trace of bluish reflection near base: remainder of gaster more bronzy, occasionally with green reflection. Legs dark blue-green, the hind tibiae tending to be brighter, the tarsi dull stramineous, with the apical segment fuscous.

Through the cooperation of Dr B. D. Burks I have been able to study 1 ♀ and 1 ♂ of Crawford's paratypes. The Waterston name caused some difficulty. He gave separate descriptions of female and male, which at first I considered to be separate species, but he selected the male as type. In the collection there was placed a series of specimens from Senegal, which again was a mixed series but which contained 1 ♂ which I could determine as *violaceus* (Waterston) and 1 ♀ which I

considered conspecific but which lacked the head. Comparison with Crawford's paratypes confirmed this association. Finally, a good series of specimens from former Eritrea, all female, in the partly sorted material of the CIE, was recognised as belonging to the same species.

Redescribed from the following. MALI: 1 ♀, Crawford paratype. SENEGAL: Bambey, 1 ♀, *ex* eggs on 'cade' (*J. Risbec*); ETHIOPIA: former Eritrea, Asmara, 14 ♀♀, 4.vii.1948, *ex* eggs of *Pachypasa* sp. (*G. de Lotto*). Waterston's male holotype from MALAWI.

The regular reticulation of the mesoscutum is a distinctive character of this species: through it I recognize the featureless female runt studied by Waterston as belonging here.

The male has the frontovertex for the most part bright red-violet and a transverse patch of the same colour beside the mandibular base: the antennal flagellum is also tinged with the same colour in the specimens in the British Museum (Natural History) though not in the paratype. Masi (1940) presumably placed *violaceus* in his key from Waterston's description of the female specimen.

### *Pediobius praeveniens* sp. n.

Head, seen from above, about two and three-quarter times breadth of its median length. Frontovertex rather less than twice the dorsal breadth of an eye and distinctly broader than its median length, with ocelli in a strongly acute triangle, the lateral not much less than their longer diameter from occipital margin, which is sharp to not much below level of top of eye; on inter-ocellar area and beside and behind the lateral ocelli rather dull, with reticulate microsculpture very distinct  $\times 65$  and comparatively outstanding, but before the ocelli shining and with sculpture less distinct. Reticulation on sides of upper face rather fine, diagonally patterned. Clypeus with a pair of lateral teeth and a small median raised projection. Eyes very weakly and sparsely hairy ( $\times 65$ ).

Antenna having scape over four times length of its greatest breadth: funicle moderately broadened in side view, the first segment about one and a third times length of its greatest breadth, the second a little longer than broad, and third decidedly broader than long, and basal club longer and broader than third funicle segment.

Pronotal collar almost straight-sided. Mesoscutum almost flat except at sides. Notauli in anterior half fine, sharply impressed, leading to notaular pits that are rather shallow and ill-defined, diagonally directed, and bear the main seta about two-fifths the way forward: mesoscutum with a trace of a median impression, rather coarsely reticulate in greater part, merging to longitudinally reticulate behind, more finely so along anterior margin and in notaular pits: hind margin weakly sinuate. Scutellum weakly convex, decidedly transverse, rather coarsely longitudinally striate, with about 17 striae above, merging to longitudinally reticulate on hinder corners. Propodeum having submedian carinae rather strongly divergent, curving gently outward, and with a rather strong median carina: nucha strongly convex, moderately emarginate at apex: spiracles very small, short-oval, much more than their longer diameter from margin of metanotum, the spiracular area, seen from above, weakly and bluntly produced above the hind coxa.

Petiole segment slightly transverse, with anterior margin scarcely raised, finely reticulate, without longitudinal ridges above. Gaster beyond petiole relatively elongate, apically acute, the first large tergite less than half its length, the first two virtually smooth, the following tergites very to extremely finely and delicately reticulate.

Hind tibial spur fine, reaching well beyond apex of corresponding metatarsus.

Frontovertex blackish bronzy merging to dark blue-green: upper and lower face dark blue-green with some brassy reflection. Antennae having scape pale brown, with only slight darkening, and pedicellus and flagellum pale brown beneath, blue-green above. Pronotum bronzy: mesoscutum and scutellum blue-green, with bronzy reflection on scutum especially in front, on sides and on axillae: propodeum above a bright blue-green. Gaster pale bronzy, the first large tergite blue-green to peacock-blue and red-violet in about basal three-quarters. Coxae blue-green: trochanters, femora and tibiae testaceous, with only slight metallic colouring near apex of hind femora: tarsi stramineous, with the apical segment brown.

Holotype ♀. UGANDA: Kampala, 1.iv.1930, 'egg parasite of *Aspidomorpha quadrimaculata* Olivier' (*H. Hargreaves*) (BMNH).

Paratypes. UGANDA: 20 ♀♀, same data as holotype. KENYA: near Mombasa, 4 ♀♀, 25.ix.1967, *ex* eggs of *Aspidomorpha puncticosta* Boheman (*D. J. Greathead*). Males are present in both series.

### *Pediobius modestus* (Masi) comb. n.

*Pleurotropis modesta* Masi, 1940 : 301-7. Holotype ♀, SOMALI REPUBLIC: Jowhar (= Villaggio Duca degli Abruzzi) (MCSN, Genoa) [examined].

? *Pleurotropis pachyceps* Masi, 1940 : 301-5. Unique holotype lost.

[? *Pleurotropis violaceus* Waterston *pro parte*; Risbec, 1951 : 51-3, 63-5. Misidentification.]

*Pleurotropis violaceus* Waterston var. *manticida* Risbec, 1958 : 68-72 : 87. Holotype ♀, ZAIRE: Kisangani (= Stanleyville) (MRAC, Tervuren). **Syn. n.**

Head, seen from above, little more than twice as broad as its median length. Frontovertex less than twice the dorsal breadth of an eye and about as broad as its median length, with ocelli in a moderately acute triangle, the lateral quite their longer diameter from occipital margin, which is sharp to below level of middle of eye; dull, rather weakly reticulate but the reticulations very distinct  $\times 45$  (condition comparable to that in *afrogrripes* nom. n. but finer). Reticulation on sides of upper face fine, on lower face and clypeus hardly distinct. Clypeus broadly almost truncate at apex. Eyes not distinctly hairy ( $\times 100$ ).

Antenna having scape about four times length of its greatest breadth: funicle moderately broadened in side view, in well-developed specimens having first segment about one and a third times length of its greatest breadth, the second a little and third decidedly broader than long, and basal club about as broad as third funicle segment: in smaller specimens the flagellar segments are relatively shorter.

Pronotum finely but very distinctly reticulate, about as on frontovertex, the anterior margin of the collar very weakly raised and not delimiting a sharp difference of sculpture, the sides of the collar sharply contracted. Notauli in anterior half fine, sharply impressed, leading to notaular pits which are shallow and ill-defined and bear the main seta rather near inner corner; mesoscutum rather finely reticulate in greater part, more coarsely so on anterior half of median third: hind margin rather weakly to moderately sinuate. Scutellum very weakly convex, finely longitudinally reticulate in middle on about anterior half, less finely so posteriorly, striate-reticulate at sides. Propodeum having a relatively strong median carina, having submedian carinae rather weakly divergent in about basal half, then much more strongly divergent, but curving inward around the nucha, which is very short, deeply emarginate at apex: spiracles small, oval, the spiracular area, seen from above, almost rectangularly produced above the hind coxa.

Petiole segment about as long as its basal breadth, with anterior margin distinctly, sharply but not strongly raised, finely to very finely reticulate and with some irregular longitudinal ridges. Gaster beyond petiole oval, the first large tergite about three-fifths its length, virtually smooth, the following tergites very to extremely finely and delicately reticulate.



Hind tibial spur fine, not or hardly reaching apex of corresponding metatarsus.

Frontovertex dark blue-green, the ridges of the reticulations blackish bronzy; upper and lower face dark blue-green with some bronzy reflection. Antennae pale brown, with greater or lesser amount of metallic green colouring. Thorax above, including pronotal collar, blackish bronzy to very dark green, the ridges of the reticulations dark, the scutellum sometimes coppery at apex: propodeum a rather bright blue-green. Gaster blackish brown, with some blue-green to blue or red-violet reflection at base of first large tergite, and occasionally more extensively. Legs dark blue-green, the tibiae sometimes pale at apex, the tarsi dull stramineous, with the apical segment brown.

Redescribed from the following. ETHIOPIA: former Eritrea, Asmara, 5 ♀♀, 23.v.1946, 'ex egg-pod of a Mantoidea sp.' (G. Jannone). SOMALI REPUBLIC: Jowhar (= Villaggio Duca degli Abruzzi), unique holotype ♀, 1930 (no biological data) (G. Russo). TANZANIA: Mpala, ♀, viii.1953, submitted together with Mantid ootheca (*H. Bomàns*); Ukinguru, 2 ♀♀, 19.iii.1959, 'ex Mantid eggs' (I. A. D. Robertson). SOUTH AFRICA: Pretoria, ♀, 12.ii.1957, 'ex small Mantid egg-case no. 4' (P. R. zur Strassen); ZAIRE: Basoko, 3 ♀♀, v.1948, 'parasite de oothèque de Mantidae' (P. G. L. Benoit) (paratypes from same reared series as holotype of 'var. *manticida*'); Yahuma, Kisangani, 4 ♀♀, xii.1948, 'parasite de oothèque de Mantidae' (P. G. L. Benoit) (paratypes of 'var. *manticida*' not from same series as holotype); Lusambo, 7 ♀♀, 1922, 'parasite de oothèque de Mante' (J. Ghesquière); Kivu, Uvina, 2 ♀♀, 3.i.1955, 'dans oothèque de mante' (G. Marlier). GHANA: Tafo, 13 ♀♀, 25.v.1945, 'ex Mantid egg-mass' (F. A. Squires). IVORY COAST: Bingerville, 7 ♀♀, iv.1962, 'éclos d'oothèque de mante' (J. Decelle). SENEGAL: Bambey, 34 ♀♀, 1939, 'ex eggs of Mantis' (J. Risbec).

Males are present in most of the series. The specimens in the series captured by J. Ghesquière and J. Decelle, located in MRAC, Tervuren are very numerous. Some paratypes of var. *manticida* Risbec, from the Basoko series, are also located in ORSTOM, mounted on two glass slides.

The unique holotype of *modestus* (Masi) has been compared directly with the series from Ethiopia (former Eritrea), Ghana and Senegal, and a specimen from each of these series has been presented to MCSN, Genoa.

Unfortunately the unique type-specimen of *pachycephs* (Masi) has been knocked off its mount, except for one leg, probably the right mid leg, and has been lost: the mount is labelled 'perduto' in Masi's writing. Despite appearances to the contrary that would be derived from Masi's paper, I think it was possibly another specimen of *modestus* (Masi) for the following reasons. It was recorded as reared from a Mantid ootheca, and I recognise only one species reared from such host in Africa. Specimens compared with the type of *modesta* have the head more strongly narrowed behind the eyes than as represented in Masi's paper (fig. 14a), and the petiolar segment, viewed directly from above, has been measured as being about as long as basally broad, though it more resembles Masi's fig. 15 if viewed obliquely. Masi's description of the nucha of *pachycephs* as not apically emarginate (p. 303) might have been due to an error of observation, which is often difficult especially in a single specimen, cf. his fig. 13b. He described the ocelli of *pachycephs* as being in an equilateral triangle, though they do not appear so in the plane in which his fig. 13a was drawn; and he described the sculpture of the scutellum as being merely less



distinct in the middle (p. 305), though from his fig. 13b one would have deduced that the species was among those with a broad median band smooth or almost so.

Examination of paratypes of Risbec's 'var. *manticida*' (1958), including some from the same reared series as the holotype, has enabled me to establish the synonymy of this name. I believe Risbec's earlier description (1951: 63-5, including figs 57-9) to refer to this species; but I have not examined the material reared from eggs of *Sphodromantis* and do not think the more numerous material from the same locality, submitted to the CIE and determined generically prior to autumn 1940, was from the same series. Dr J. R. Steffan confirms that 'souche', used by Risbec (1958), is a word of imprecise meaning: though most usually applied in biology to a strain, it clearly does not have that connotation there. It seems likely that the material recorded by Risbec (1951) and placed as *violaceus* (Waterston) from Ivory Coast, Abengourou, was not misidentified.

This and the known Asiatic species reared from Mantid oothecae are quite distinct: see pp. 173-174 below, on the latter of which the main differences are tabulated.

### *Pediobius hirtellus* (Masi) comb. n.

*Pleurotropis hirtella* Masi, 1940: 301-2, 307-9. Holotype ♀, SOMALI REPUBLIC: Jowhar (= Villaggio Duca degli Abruzzi) (MCSN, Genoa) [examined].

Head, seen from above, about two and a third times breadth of its median length. Frontovertex about one and a half times the dorsal breadth of an eye and about as broad as its median length, with ocelli in an almost equilateral triangle, the lateral about their shorter diameter from occipital margin: dull, finely reticulate, the reticulation before and on the interocellar area quite distinct  $\times 65$ , weaker beside and behind the lateral ocelli. Setae and the punctures from which they arise very prominent. Reticulation on sides of upper face fine, about as fine as on frontovertex, though more outstanding. Occiput very conspicuously hairy. Eyes strongly but sparsely hairy.

Antenna having scape almost parallel-sided, about four times length of its greatest breadth: funicle slightly broadened in side view, the first segment about one and a half times length of its greatest breadth, the second a little longer than broad, the third a little broader than long, and basal club about as broad as third funicle segment.

Pronotum having neck elongate, having collar strongly expanded at sides and then sharply contracted; very distinctly finely longitudinally striate-reticulate, with anterior margin sharply raised, narrowly emarginate in middle. Notauli in anterior half fine, sharply impressed, leading to longitudinal impressions in the notaular pits, these pits rather shallow, ill-defined on outer side, bearing the main seta in the impression about half the way forward: mesoscutum rather coarsely reticulate on mid lobe, merging to longitudinally reticulate on hinder half, very finely so on parapsides: hind margin broadly and weakly sinuate. Scutellum very weakly convex, regularly longitudinally striate-reticulate at sides, with a median band that is almost smooth but is less wide relatively than in *furvum* (Gahan): despite Masi's description I find this median band to be percurrent. Propodeum having upper surface extremely finely reticulate, having submedian carinae rather close together at base, weakly divergent in about basal two-thirds, then curved outward: nucha elongate, very finely reticulate: spiracles small, oval, more than their longer diameter from margin of metanotum, the spiracular area, seen from above, produced into a rather sharp tooth above the hind coxa. [It appears to me that Masi's illustrator was deceived in this case: I find, in the unique type, the apex of the nucha to be covered by the fore margin of the petiole, and I see the submedian carinae as closer and the spiracle as relatively smaller than as shown.]

Petiolear segment about as long as its basal breadth, finely reticulate, with some weak and very incomplete longitudinal ridges above. Gaster beyond petiole oval, the first large tergite about half its length, the first on about hinder half and the following tergites finely but very distinctly reticulate, though with smooth apical margins.

Frontovertex, upper and lower face very dark blue-green. Antennae brown, with weak metallic colouring above. Pronotal collar dark blue-green: mesoscutum and scutellum steely green to blackish: mesopleura very dark blue-green: propodeum above steely green, the nucha with some slight brighter reflection. Gaster blackish, with slight green to indigo reflection near base of first large tergite. Legs blue-green, the femora steely green, the tarsi dark stramineous, with the apical segment brown.

Redescribed from the unique holotype: SOMALI REPUBLIC.

I have failed to find further specimens of this species among the generically determined material received over the years by the CIE.

BIOLOGY. Taken on a cotton plant but biology unknown.

### *Pediobius furvum* (Gahan) comb. n.

*Pleurotropis furvum* Gahan, 1928 : 257. Holotype ♀, SUDAN: Khartoum (USNM, Washington).  
*Pleurotropis furvum* Gahan; Masi, 1940 : 301-3.

Head, seen from above, broad, scarcely emarginate anteriorly, up to three times breadth of its median length. Frontovertex over twice the dorsal breadth of an eye and about one-third broader than its median length, with ocelli in a distinctly obtuse triangle; in greater part shining and almost smooth, there being no sculpture distinct  $\times 65$ , on inter-ocellar area and behind and beside the lateral ocelli with some extremely fine reticulation. Sides of upper face reticulate, the ridges not strongly raised but the meshes comparatively coarse. Eyes sparsely but quite distinctly hairy ( $\times 65$ ).

Antenna having scape distinctly curved, about five times length of its greatest breadth: funicle evidently broadened in side view, the first segment about one and two-thirds times, the second about one and a half times length of its greatest breadth, the third distinctly longer than broad, the segments distinctly petiolate at apex.

Thorax very weakly convex, almost flat. Sides of pronotal collar very well rounded, slightly narrowed. Notauli sharply impressed, sometimes effaced beyond middle, when percurrent then running just outside of the relatively weak main seta, which arises rather near the scutellar suture, the notaular pits scarcely defined: mesoscutum weakly reticulate, often merging to longitudinally striate-reticulate on hinder half of mid lobe: hind margin broadly and weakly sinuate. Scutellum very weakly convex, weakly longitudinally striate-reticulate at sides, with a rather broad median band that is almost smooth. Propodeum having submedian carinae rather close at base, diverging gently in about basal half and then decidedly more strongly, without or with the merest trace of a median carina: nucha deeply emarginate at apex: spiracles almost circular, the spiracular area, seen from above, produced into a weak lobe above the hind coxa.

Petiolear segment much broader at base than long, with anterior margin only moderately raised, above with rather strong longitudinal ridges extending beyond middle, finely reticulate behind. Gaster beyond petiole broad to very broad-oval, about two-thirds as broad as long, the first large tergite about two-thirds its length, finely and delicately reticulate on the bronzy part, the following tergites with some very fine reticulation.

Hind tibial spur slightly curved, hardly reaching apex of corresponding metatarsus.

Head blue-black to dark blue-green, with bronzy reflections. Antennae dark blue-green. Thorax mostly blackish at sides, greenish black above, the propodeum above and usually the

pronotal collar a much brighter green. Gaster in greater part dull brown with weak bronzy reflection, the first large tergite largely bright green in about basal half. Legs green, the tarsi pale stramineous, with the apical segment fuscous.

Redescribed from female specimens in series from SIERRA LEONE, GHANA, N. NIGERIA, RHODESIA, KENYA and SUDAN, including the three paratypes now standing in the collection of the British Museum (Natural History). Many males are also present.

The very weak convexity of the thorax has not been mentioned by other authors. Gahan's statement that the first tergite is not green is to be explained by his having examined the specimens presumably with a strong spotlight (cf. Kerrich, 1953, p. 800, 1967, p. 146). His description of the vertex as weakly sculptured all over is harder to understand, for before and beside the median ocellus and beside and behind the lateral ocelli I do not find the sculpture to be distinct  $\times 100$ . Masi (1940) placed the species after the alternate in his key in which the scutellum is without a smooth median band.

BIOLOGY. This species has frequently been received as a parasite of the stalk-boring Lepidoptera, *Busseola*, *Sesamia* and *Chilo*. See also Mohyuddin & Greathead (1970, pp. 257, 270).

***Pediobius telenomi* (Crawford) comb. n.**

*Pleurotropis telenomi* Crawford, 1911 : 445. Holotype ♀, UGANDA: Entebbe (USNM, Washington).

*Pleurotropis telenomi* Crawford; Waterston, 1915 : 345, 362.

*Pleurotropis telenomi* Crawford; Masi, 1940 : 301-2.

Head, seen from above, moderately emarginate in front and rather deeply so behind, nearly three times breadth of its median length, the occipital carina strongly raised. Frontovertex about twice the dorsal breadth of an eye and one-half broader than its median length, with ocelli in a very decidedly obtuse triangle; in greater part shining and almost smooth, on interocellar area and behind and beside the lateral ocelli duller, though with reticulation scarcely distinct  $\times 65$ . Sides of upper face with reticulation hardly distinct  $\times 65$ . Eyes rather sparsely and obscurely hairy.

Antenna (Waterston, 1915, fig. 4c) having scape about four times length of its greatest breadth, almost parallel-sided in apical two-thirds: funicle very distinctly broadened in side view, having all segments quadrate or broader than long and shortly petiolate at apex.

Sides of pronotal collar slightly broadened in greater part, then sharply narrowed to hind margin. Notauli extremely fine, usually effaced in middle, the notaular pits ill-defined, rather diagonal, bearing the main seta about one-third the way forward: mesoscutum very finely reticulate, markedly less finely striate-reticulate in the notaular pits: hind margin moderately sinuate. Scutellum relatively strongly striate-reticulate at sides, with a median band of moderate breadth that extends for its whole length and is almost smooth. Propodeum rather strongly convex, having submedian carinae curving outward, diverging comparatively strongly, though at much less than  $45^\circ$ , with median carina normally complete and sharp: nucha small, well rounded at apex: spiracles short-oval, the spiracular area, seen from above, produced into a blunt lobe above the hind coxa.

Petiolar segment about quadrate, with anterior margin sharply but weakly raised, very finely reticulate. First large tergite not quite half length of gaster beyond petiole, smooth, the following tergites with sculpture just discernible  $\times 65$ .



Hind tibial spur slightly curved, reaching just beyond apex of corresponding metatarsus. Length little more than 1 mm.

Frontovertex blue-black, with bronzy reflection: upper and lower face and cheeks green, with brassy or occasionally coppery reflection. Antennae and sides of thorax dull blue-green: pronotum above, often including the collar, and the mesoscutum blackish: scutellum dull brassy green: propodeum above bright blue-green. Gaster in greater part dark brown with bronzy reflection, the first large tergite more or less extensively blue-green to red-violet. Legs largely dull ochreous with only light metallic colouring, which is often stronger in part, especially on hind coxae.

UGANDA. Redescribed from 8 ♀ paratypes in collection of British Museum (Natural History), which contains two male paratypes also. The sculpture of the mesoscutum is appreciably stronger and coarser in the male than in the female.

BIOLOGY. Reared from eggs of *Anaphe infracta* Walsingham (Lep., Thaumato-poeidae) together with *Telenomus gowdeyi* Crawford (Scelionidae), presumably as secondary parasite through the *Telenomus* (see Crawford, 1911).

### *Pediobius africanus* (Waterston) comb. n.

(Text-fig. 8)

*Pleurotropis africanus* Waterston, 1915 : 345, 348, 353, 357, 360-2. LECTOTYPE ♀, MALAWI: Zomba (BMNH), here designated [examined].

*Pleurotropis africanus* Waterston; Masi, 1940 : 301-2.

Head, seen from above, two and two-thirds to three times breadth of its median length, comparatively strongly emarginate in front. Frontovertex about or nearly twice the dorsal breadth of an eye, and usually about one and a half times breadth of its median length, with ocelli in a slightly to distinctly obtuse triangle; weakly reticulate throughout, but the reticulation quite distinct  $\times 45$ . Sides of upper face moderately reticulate. Eyes not evidently hairy ( $\times 100$ ).

Antenna having scape about three and a half times length of its greatest breadth: funicle moniliform, strongly broadened in side view, the first segment little longer than its greatest breadth, the second about quadrate, the third very distinctly broader than long, the segments strongly petiolate at apex, and club distinctly broader than the third funicle segment.

Pronotal collar rounded at sides and in greater part distinctly broadened; with reticulation very fine, sometimes indistinct. Notauli extremely fine, running to notaular pits that are of moderate depth, rather large, and bear the main seta about one-third the way forward: mesoscutum finely reticulate in middle to striate-reticulate: hind margin moderately sinuate. Scutellum longitudinally striate to striate-reticulate, narrowly in mid line with sculpture weaker, this median sculpture sometimes almost evanescent, especially behind, yet the median band not so smooth as Waterston seems to have implied, nor so broad as would appear from Terzi's drawing. Propodeum markedly convex, having submedian carinae almost straight and moderately divergent, and with a median carina: nucha strongly convex, sharply emarginate at apex: spiracles rather short-oval, the spiracular area, seen from above, produced into a rounded lobe above the hind coxa.

Petiolar segment a little shorter than its breadth at extreme base, very finely reticulate, with longitudinal ridges of moderate strength at sides but absent or very weak and incomplete above. Gaster beyond petiole broad-oval, the first large tergite about two-thirds its length, with median reticulation on apical half extremely delicate, just discernible  $\times 65$ , the following tergites with some very fine reticulation.

Wings having cubital hair-row sparse immediately beyond basalis, then much denser, very



distinctly arcuate. Hind tibial spur strongly curved, extending to about three-quarters length of second tarsal segment.

Length about 1.2 mm.

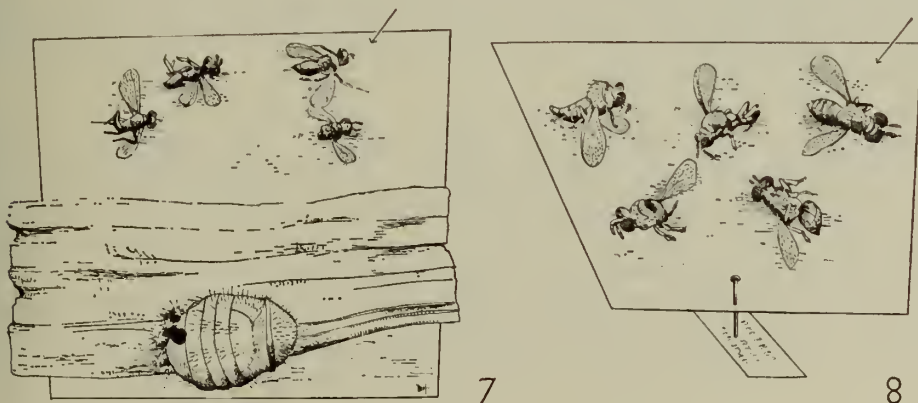
Frontovertex blackish bronzy, sometimes (as in type-series) very dark blue-green in the meshes: upper and lower face blue-green. Antennae blue-green. Thorax including pronotal collar blackish brown, the propodeum above and tegulae dark blue-green. Gaster blackish brown, with a trace of greenish or bluish reflection in about basal third. Legs dark blue-green, the tarsi dull stramineous, with the apical segment pale fuscous.

The syntypes stand in the collection of the British Museum (Natural History) as follows: 10 ♀♀, 2 ♂♂ mounted on card, and parts of 2 ♀♀ mounted on slides. On one card five specimens are mounted: I select as lectotype the female specimen in the top right-hand corner, numbered 3 on a diagram on a label.

Redescribed from the card-mounted female syntypes, MALAWI, and from the following. KENYA: Kiambu, 7 ♀♀, 1933, *ex* eggs of *Antestiopsis orbitalis bechuana* (Kirkaldy) (= *Antestia lineaticollis* Stål) (Hem., Pentatomidae) (R. H. Le Pelley); 3 ♂♂ also present in this Kenya series.

The head is decidedly broader than the thorax as stated by Waterston and Masi, but not so greatly more so than in *anastati* and *homoeus*. Masi (1940) placed this species after the first alternate of couplet 2 of his key, i.e. as having the scutellum with a smooth median band.

BIOLOGY. This species has been reared as a hyperparasite of eggs of *Antestiopsis* spp. (Pentatomidae) through *Trissolcus seychellensis* (Kieffer) and *Gryon* (= *Hadronotus*) *antestiae* (Dodd) (Scelionidae). 'The insect shows no continuing reaction to unparasitized eggs' and 'the minimum time the primary must have been present in the *Antestiopsis* egg to enable *Pediobius* to lay and successfully produce offspring is thought to be 7 days' (Le Pelley, 1968, pp. 271-2).



FIGS 7-8. Drawings illustrating the syntype mounts of 7, *P. foveolatus* ssp. *mediopunctatus* (Waterston) and 8, *P. africanus* (Waterston), the arrow indicating the lectotype in each case. Brian Hargreaves del.

*Pediobius vignae* (Risbec) comb. n.

*Pleurotropis vignae* Risbec, 1951 : 51-3, 67. NEOTYPE ♀, NIGERIA: Ibadan (BMNH), here designated [examined].

Head, seen from above, about two and two-thirds times breadth of its median length. Frontoververtex twice the dorsal breadth of an eye and rather less than one and a half times breadth of its median length, with ocelli in a decidedly acute to very slightly obtuse triangle; shining, but with fine, irregular reticulation evident  $\times 65$ . Sides of upper face with reticulation rather weak, rather fine, diagonally directed: clypeus with extremely fine reticulation. Eyes rather sparsely hairy, just distinctly so  $\times 25$ .

Antenna having scape slender, about six times length of its greatest breadth: funicle slightly broadened in side view, the first segment a little longer than broad, the second about quadrate, and third a little broader than long, and club scarcely broader than third funicle segment.

Pronotal collar almost straight-sided, slightly narrowed, with some weak reticulation and irregular longitudinal striation. Notauli extremely fine, running to notaular pits that are diagonally directed and moderately to rather deep, and bear the main seta about two-fifths the way forward: mesoscutum rather coarsely longitudinally reticulate or irregularly striate in middle, more finely reticulate anteriorly and in the notaular pits, longitudinally striate beside the pits and moderately reticulate at sides: hind margin weakly to moderately sinuate. Scutellum longitudinally striate almost throughout, with a very narrow median band of weaker sculpture. Propodeum having submedian carinae gently divergent, curving gently outward and with no median carina or occasionally an incomplete one: nucha rather deeply emarginate behind: spiracles small, elongate-oval, the spiracular area, seen from above, produced into a sharp tooth above the hind coxa.

Petiolear segment a little broader at base than long, with rather fine reticulation comparatively strongly outstanding. Gaster beyond petiole ovate, pointed: first large tergite well over half its length, with reticulation present on less than apical half, comparatively strong, very distinct  $\times 45$ , the following tergites very finely reticulate to trans-striate.

Hind tibial spur slightly curved, extending well beyond apex of corresponding metatarsus.

Head blue-black to very dark green, with slight bronzy reflection. Antennae dark blue-green. Thorax mainly blackish, with weak brighter reflection, the propleura in part and mesopleura above dark blue-green, the pronotal collar, tegulae and propodeum bright blue-green. Gaster blackish, though not so dark as mesonotum, the first large tergite blue-green in less than basal half. Legs dark blue-green, the hind tibiae brighter above, the tarsi stramineous, with the apical segment strongly infusate.

Described from the following. NIGERIA: Ibadan, 5 ♀♀ (including neotype) 12.v.1971, *ex* puparia *Melanagromyza signalis* Spencer (Agromyzidae) (det. K. A. Spencer) on *Vigna unguiculata* (Leguminosae) (W. K. Whitney). 'FRENCH SUDAN', 2 ♀♀ (probably 1946), '*ex* seeds of *Vigna*' (R. Dugast). Two males are present in the latter series: they have the thorax mainly blue-green.

The above two series of specimens, which have been reared in association with *Vigna*, run in the key of Risbec (1951) to *vignae* (Risbec). I place them as that species although I cannot make sense of the differences given (p. 67) from *dipterae* (Risbec), which is studied below in the present work. Risbec presumably intended to include an extensive description of *vignae* in 1951: he made no mention of the species whatever in his 1958 paper.

Since the original material has not been traced in ORSTOM, a neotype is designated here. A female specimen from 'French Sudan' will be deposited in ORSTOM.

*Pediobius* species, *afronigripes* group

These are related to the palaearctic species *pyrgo* (Walker). *P. pyrgo* differs from all four here treated in having the first large tergite distinctly, finely and rather densely punctate in greater part above, and in that the hind tibial spur extends very little beyond apex of the corresponding metatarsus. It has the head less narrowed behind eyes, less even than in *vigintiquinque* Kerrich. The frontovertex has reticulation very distinct  $\times 45$  as in *afronigripes* nom. n. though somewhat finer. The eyes are decidedly more strongly and densely hairy than in *amaurocoelus* (Waterston), very distinctly hairy  $\times 25$ . The funicle is strongly broadened in side view, more so than in *dipterae* (Risbec), having the third segment about one and a half times as broad as long. The sculpture of the mesoscutum is of similar pattern but a little weaker and finer than in *afronigripes* though much stronger than in the other three species.

*Pediobius afronigripes* nom. n.

*Pleurotropis nigripes* Waterston, 1915 : 345-6, 348, 353-5, 357. LECTOTYPE ♀, NIGERIA: Ibadan (BMNH), here designated [examined]. [Secondary homonym of *Semiotellus*(?) *nigripes* Lindemann, 1887 (= *Pediobius epigonus* (Walker, 1839).)]  
*Pleurotropis nigripes* Waterston; Masi, 1940 : 301-2.  
*Pediobius nigripes* (Waterston) Kerrich, 1970 : 328-9.

Head, seen from above, about two and two-thirds times breadth of its median length. Frontovertex about or rather less than twice the dorsal breadth of an eye and one quarter broader than its median length, with ocelli in an almost equilateral triangle; rather dull, in greater part rather weakly reticulate but the reticulations very distinct  $\times 45$ , in inter-ocellar area and behind the lateral ocelli with reticulation rather fine. Sides of upper face moderately reticulate. Eyes finely and sparsely hairy.

Antenna (Waterston, 1915, fig. 2g) having scape about five times length of its greatest breadth: funicle not evidently broadened in side view, the first segment about one and a half times length of its greatest breadth, the third very distinctly longer than broad, the segments distinctly petiolate at apex.

Pronotal collar having sides slightly to moderately narrowed. Notauli sharply impressed and moderately strong in anterior two-fifths, almost effaced behind this: notaular pits ill-defined but bearing a deeper diagonal furrow, and the main seta about one-third the way forward, this seta relatively strong, extending back to about mid point of scutellum: mid lobe of mesoscutum with reticulation rather wide-meshed and of moderate strength in middle, merging to striate-reticulate in front, behind and towards the notauli, the parapsides more finely striate-reticulate in greater part, moderately reticulate at sides: hind margin moderately sinuate. Scutellum rather strongly longitudinally striate-reticulate, having a median band that is narrow and with evanescent sculpture in front, rather broader and almost smooth behind. Propodeum (Waterston, 1915, fig. 5) having submedian carinae curving gently outward and with a median carina or strong indication of such: nucha rather strongly convex, moderately emarginate at apex: spiracles short-oval, the spiracular area, seen from above, produced into a sharp tooth above the hind coxa.

Petiole segment much broader at base than long, with anterior margin strongly raised, rather finely reticulate, with longitudinal ridges absent or weak and very incomplete. First large tergite about half length of gaster beyond petiole, very delicately reticulate on the bronzy part, the following tergites extremely finely reticulate to trans-striate.

Hind tibial spur curved, extending far beyond apex of corresponding metatarsus.



Head blue-green, with weak brassy and bronzy reflections. Antennae blue-green. Thorax blue-green, the pronotal collar and also the propodeum above tending to be rather brighter. Gaster dark bronzy, the first large tergite blue-green in about basal two-thirds. Legs dark blue-green, the tarsi stramineous, with the apical segment fuscous.

Of the syntypes there now stand in the collection of the British Museum (Natural History) 7 ♀♀, 2 ♂♂, mounted on four cards altogether. I select as lectotype the right-hand specimen of three females mounted on one card: the other two specimens on this card lack the head. I find no slide-mounted material in the collection, nor is there any cocoon of a primary parasite mounted on any of the cards or separately.

Redescribed from the female syntypes, NIGERIA, and the following. ETHIOPIA: former Eritrea, Ala Plain, Decamere, 1 ♀, 9.ix.1963, *ex Spodoptera* (= *Laphygma*) *exempta* (Walker) (*E. S. Brown*). UGANDA: Kampala, 12 ♀♀, v.1925, *ex Apanteles* cocoons (*G. L. R. Hancock*). NIGERIA: 2 ♀♀, 30.iv.1969, *ex* cocoons on leaf, *per* Ministry of Agriculture, Harpenden.

### *Pediobius vigintiquinque* Kerrich

(Pl. 3, fig. 6)

[*Pleurotropis nigripes* Waterston; Waterston, 1925 : 395. Misidentification.]

*Pediobius vigintiquinque* Kerrich, 1970 : 328-9. Holotype ♀, GHANA: Pretsea (BMNH) [examined].

*Pediobius* sp. 'hyperparasite', Mariau & Morin, 1971 : 86.

Head, seen from above, little more than twice breadth of its median length, less sharply narrowed behind eyes than in *afronigripes* nom. n. and *amaurocoelus* (Waterston) (Kerrich, 1970 : 328-9). Frontovertex about twice the dorsal breadth of an eye and less than a quarter broader than its median length, with ocelli in an almost equilateral triangle; in greater part shining and almost smooth, though on inter-ocular area with reticulation just comfortably distinct  $\times 65$  or sometimes weaker. Sides of upper face moderately reticulate. Eyes extremely finely and sparsely hairy.

Antenna having scape about five times length of its greatest breadth: funicle evidently broadened in side view, the first segment about one and a half times length of its greatest breadth, the third about quadrate, the segments very distinctly petiolate at apex.

Pronotal collar having sides slightly or, more often, moderately narrowed. Notauli sharply impressed, very fine, running into the notaular pits which are ill-defined and bear the main seta about one-third the way forward: sculpture of mesoscutum much as described for *afronigripes* nom. n. but much weaker, the parapsides usually almost wholly reticulate: hind margin moderately sinuate. Scutellum finely longitudinally striate-reticulate at sides, with a median band that normally is relatively broad, about as broad as the distance between the setae in the notaular pits, and is smooth or almost so, but is narrower in darker coloured specimens. Propodeum having submedian carinae diverging gently and almost regularly from base, and with a median carina that usually is very distinct but does not reach base: nucha rather strongly convex, rather deeply emarginate at apex: spiracles elongate-oval, little more than their longer diameter from margin of metanotum, the spiracular area, seen from above, produced into a very sharp tooth above the hind coxa.

Petiole segment little broader at base than long, with anterior margin only moderately raised, rather finely reticulate, with longitudinal ridges extremely weak and incomplete. Gaster beyond petiole about as described for *afronigripes* nom. n., but sometimes relatively elongate.

Hind tibial spur curved, extending far beyond apex of corresponding metatarsus.



Frontovertex dark blue-green to dull blue, occasionally with red-violet: upper and lower face and cheeks a brighter green, with bronzy reflections. Antennae blue-green, the metallic colour sometimes pale. Thorax blue-green, or in part blue or red-violet, with infusions of bronzy especially along fore margin of mesoscutum, around notauli and at sides of scutellum: sometimes the thorax is largely blackish: propodeum blue-green, or sometimes in large part red-violet. Gaster dull brown, the first large tergite in about basal half blue-green, merging to blue and red-violet, or more extensively red-violet. Legs green, or sometimes in part blue to red-violet, the tarsi stramineous, with the apical segment fuscous.

GHANA, IVORY COAST. Described from holotype and female paratypes. Many males also present in the series. This species is a hyperparasite.

BIOLOGY. This species has been reared as a secondary parasite of *Coelaenomeno-dera elaidis* Maulik (Hispidae) through *Pediobius setigerus* Kerrich, *Sympiesis kampalonus* (Ferrière) and *Cotterellia podagrica* Waterston (see Kerrich, 1970; Mariau & Morin, 1971).

### *Pediobius amaurocoelus* (Waterston)

*Pleurotropis amaurocoela* Waterston, 1915 : 345-6, 348, 355-7. LECTOTYPE ♀, MALAWI: Dedza (BMNH), here designated [examined].

*Pleurotropis amaurocoela* Waterston; Masi, 1940 : 301-2.

*Pediobius amaurocoelus* (Waterston) Kerrich, 1970 : 328-9.

Head, seen from above, about or nearly three times breadth of its median length. Frontovertex about twice the dorsal breadth of an eye and one-third broader than its median length, with ocelli in an almost equilateral triangle; in greater part shining, with reticulation not or hardly distinct  $\times 65$ , though in inter-ocellar area very fine, the meshes just comfortably distinct  $\times 45$ . Sides of upper face rather finely reticulate. Eyes rather sparsely but moderately strongly hairy, the hairs very distinct  $\times 45$ .

Antenna (Waterston, 1915, fig. 2i) having scape about six times length of its greatest breadth: funicle evidently broadened in side view, the first segment nearly one and a half times length of its greatest breadth, the third a little broader than long, the segments petiolate at apex.

Pronotal collar having sides slightly to moderately narrowed. Notauli sharply impressed, fine, not effaced medially but running into the notaular pits which are as described for *afro-nigripes* nom. n.: sculpture of mesoscutum much as described for *afro-nigripes* though much weaker: hind margin moderately sinuate. Scutellum as described for *afro-nigripes*, but the sculpture weaker. Propodeum (Waterston 1915, fig. 8) having submedian carinae curving gently outward, rather closer together at base than in *afro-nigripes*, and with a very fine median carina: nucha short and rather strongly convex (this is not clearly represented in Terzi's drawing), weakly emarginate at apex: spiracles very small, short-oval, much more than their longer diameter from margin of metanotum, the spiracular area, seen from above, produced into a very sharp tooth above the hind coxa.

Petiole segment as described for *afro-nigripes*, but very finely reticulate. Gaster beyond petiole as described for *afro-nigripes*.

Hind tibial spur curved, extending far beyond apex of corresponding metatarsus.

Head blue-green to dark blue, with shining brassy to bronzy reflections. Antennae blue-green with brassy reflection. Thorax blue-black, or sometimes mainly blue-green above, the pronotal collar and propodeum above brighter. Gaster dull brown, the first large tergite with some blue or blue-green reflection, usually only in basal half but sometimes more extensive. Legs green to, more usually, blue, the tarsi pale stramineous, with the apical segment fuscous.

Syntype material. MALAWI, NIGERIA and EGYPT. All ten female specimens now stand in the collection of the British Museum (Natural History), except one of

the Nigerian series. Waterston stated, however, that the type was a ♀ from Dedza, Malawi and I select the better of these two specimens as lectotype. One antenna of the paralectotype was mounted on a slide. The other specimens are paratypes.

Redescribed from the female syntypes and the following. KENYA: Nakuru, ♀, 11.vi.1965, ex *Ecphoropsis* sp. (Ichneumonidae) on *Spodoptera* (= *Laphygma*) *exempta* (Walker) (E. S. Brown). TANZANIA: Karatu, 6 ♀♀, 5.v.1965, ex *S. exempta* (Walker) (E. S. Brown).

Also attributed to this species. ZAIRE: Bambesa, 6 ♀♀, xii.1936-i.1937, ex *Sylepta derogata* Fabricius on cotton (*J. Vrydagh*) (det. Ch. Ferrière).

And further: GHANA: Kumasi, 1 ♀, 1 ♂, em. 27.vi.1971, ex pupa of *Epilachna similis* Thunberg, on maize (*G. Scheibelreiter*). Dr Scheibelreiter confirms the accuracy of this record, stating that the pupa was isolated in a glass tube, so presumably these two small specimens were acting as hyperparasites.

I do not notice any essential difference from *afrogriseipes* nom. n. in the pattern of the sculpture of the scutellum, such as appears to have been deduced by Masi (1940: 302) from Terzi's drawing in Waterston's paper. Waterston's observation on the 'preapical hollows', at the anterior end of the nucha, appears to be sound but seems poor as a diagnostic character.

### *Pediobius dipterae* (Risbec) comb. n.

*Pleurotropis dipterae* Risbec, 1951: 51, 66-7. Syntypes of both sexes, SENEGAL: Bambey (ORSTOM, Paris) [examined].

Head, seen from above, rather broad, nearly three times breadth of its median length. Fronto-vertex comparatively narrow, about one and a half times the dorsal breadth of an eye and one-fifth broader than its median length, with ocelli in a strongly acute triangle; less shining than in *amaurocoelus* (Waterston), in greater part not quite smooth though having sculpture present though very indistinct, but on inter-ocellar area with reticulation distinct  $\times 65$ . Eyes rather finely but moderately densely hairy, more densely so than in *amaurocoelus* (Waterston).

Antenna having flagellum rather strongly broadened in side view, the first funicle segment somewhat longer than broad, the third much broader than long, and basal club a little broader than third funicle segment.

Pronotal collar having sides scarcely rounded, slightly narrowed. Notauli extremely fine: notaular pits ill-defined but of moderate depth, bearing the main seta not far forward, this seta not uncommonly strong and not nearly reaching mid point of scutellum: mesoscutum very finely reticulate on mid lobe, merging to finely striate-reticulate behind and beside this, the parapsides moderately reticulate in hinder corner: hind margin scarcely sinuate. Scutellum striate-reticulate at sides, having a median band that is rather narrow, not quite smooth but with sculpture very indistinct. Propodeum having submedian carinae rather close together at base, diverging gently and almost rectilinearly to near apex, where they curve inward: nucha strongly convex, weakly emarginate at apex: spiracles small, short-oval, much more than their longer diameter from margin of metanotum.

Petiole segment much broader at base than long, with anterior margin weakly raised, very finely reticulate and with longitudinal ridges incomplete. Remainder of gaster rather elongate and pointed, the first large tergite about two-fifths its length.

Hind tibial spur strongly curved, extending far beyond apex of corresponding metatarsus.

Frontovertex blue-green, merging to bronzy above the frontal fork: upper face, lower face and genae a darker blue-green with much infusion of bronzy. Antennae somewhat darker

blue-green than frontovertex. Thorax and sides of propodeum brownish black with weak bronzy reflection: pronotal collar blue-green and brighter bronzy: tegulae blue-green: propodeum above bright blue-green. Gaster blackish brown with weak bronzy reflection, the first large tergite bright blue-green above in about basal two-thirds. Legs blue-green, the tarsi stramineous to pale testaceous, with the apical segment somewhat infusate.

Redescribed from the following. SENEGAL: Bambey, 6 ♀♀, 21.X.1946 (*J. Risbec*). I assume these to be syntypes, reared from pupae of Diptera in a stem of millet, although there are six males, and not only one as recorded by Risbec, as well as the six females mounted on the same glass slide. The redescription has been made in conformity with my other descriptions so far as was practicable, but some features could not be seen so clearly as on card-pointed specimens, which may be viewed from all angles. The measurements must be regarded as less accurate. Apart from the antennal flagellum, the redescription has been made mostly from the female specimen that is nearly dorsoventrally situated on the slide. The heads of all female specimens had become detached from the bodies.

The single male specimen recorded by Risbec as reared from a Cosmopterygid pupa from Niébé is mounted on another slide. The specimen is very severely crushed. It is extremely unlikely to belong to the same species. I have not seen the material recorded by Risbec (1958: 75) as reared by R. Paulian from thrips in Madagascar, but it seems unlikely that Risbec was correct in attributing this to the same species.

#### KEY TO THE FEMALES OF THE AFRICAN SPECIES STUDIED

- 1 Frontovertex having reticulation strong or moderately strong and more or less regular . . . . . 2
- Frontovertex having reticulation rather weak to indistinct, or regular but fine . . . . . 7
- 2 Bristles on head and thorax mostly black, relatively short and stout: eyes strongly but very sparsely hairy: sculpture on frontovertex, mesoscutum and scutellum remarkably similar, reticulate, usually a little coarser on mesoscutum than on frontovertex and a little coarser on scutellum than on mesoscutum: submedian carinae of propodeum approximately parallel, not close (Pl. 1, fig. 1): antennal scape in greatest part pale testaceous: femora and tibiae pale testaceous, with only slight metallic darkening on the femora . . . . . *ropalidiae* (Risbec) (p. 119)
- Bristles on head and thorax paler, normal for the genus (see other plate figures): eye pilosity very different: sculpture on mesoscutum and on scutellum markedly dissimilar: submedian carinae of propodeum closer at base and more or less divergent: antennal scape, femora and tibiae in greatest part strongly metallic blue-green . . . . . 3
- 3 Propodeum and pronotal collar covered with outstanding fine reticulation, not at all shining: mesoscutum and scutellum hardly shining, the sculpture close and strongly outstanding . . . . . *rhyssonotus* (Waterston Ms.) sp. n. (p. 120)
- Propodeum and pronotal collar shining, with reticulation absent or restricted and very fine: mesoscutum and scutellum more or less shining, the sculpture (e.g. Pl. 2, figs. 3, 4) less close and often less outstanding . . . . . 4
- 4 Rather small species of length about 1½ mm: eyes strongly convergent below and extending far below level of toruli (Text-fig. 4): ocelli in about an equilateral triangle but frontovertex not narrow, the lateral ocelli distinctly more than their longer diameter from orbital margin: third funicle segment much broader than



long: petiolar segment over  $1\frac{1}{2}$  times length of its greatest breadth: gaster beyond petiole oval, not pointed toward apex, more densely hairy than in alternate

*taylori* sp. n. (p. 121)

- Mostly larger insects: eyes not or hardly convergent below and not extending far below level of toruli: if the ocelli are in about an equilateral triangle the lateral are less than their shorter diameter from orbital margin: third funicle segment about quadrate or longer than broad: gaster pointed toward apex . . . . . 5
- 5 Frontovortex narrow, distinctly less than the dorsal breadth of an eye, having median ocellus little more than its own breadth from orbital margin: eyes very densely hairy: hind tibial spur abnormally strong, nearly reaching apex of second tarsal segment . . . . . *angustifrons* sp. n. (p. 122)
- Frontovortex distinctly more than the dorsal breadth of an eye, having median ocellus about one and a half times its own breadth or more from orbital margin: eyes much less densely hairy: hind tibial spur of normal strength for the genus, reaching only a moderate distance beyond apex of metatarsus or occasionally not reaching apex of that segment . . . . . 6
- 6 Head of normal shape for the genus, the frontovortex no more than about a quarter broader than long, the ocelli in a right-angled to acute triangle: eyes densely hairy: petiolar segment transverse: gaster beyond petiole more elongate and pointed, the first large tergite less than half its length: fourth segment of mid and hind tarsi only slightly darkened: associated with Lepidoptera

*neavei* (Waterston) (p. 123)

- Head short and broad, the frontovortex about one-half or more broader than long, the ocelli in a slightly to very distinctly obtuse triangle [in all African material seen, in a very distinctly obtuse triangle]: eyes moderately strongly and densely hairy (cf. p. 163): petiolar segment, in African material studied, about a quarter longer than broad: gaster beyond petiole less elongate and pointed, the first large tergite about half its length or more: fourth segment of mid and hind tarsi well darkened: parasite of Epilachninae

*foveolatus* (Crawford) subsp. *mediopunctatus* (Waterston) (p. 124)

- 7 Scutellum bearing about ten strong setae on either side: mesoscutum with setae stout and rather numerous: pronotum with about sixteen strong setae arising behind elevated margin of pronotal collar (Pl. 1 fig. 2) *setigerus* Kerrich (p. 125)
- Scutellum bearing the normal pair of bristles: setae on mesoscutum not so numerous, on pronotum normally six, as seen from above, arising behind anterior margin of pronotal collar . . . . . 8
- 8 Head, as seen from above (Text-fig. 1) rounded before and behind eyes, the occiput narrow and sloping backward: petiolar segment strongly produced forward at sides, embracing the nucha: remainder of gaster (Text-fig. 2) very elongate, the first large tergite bulbous, the first five strongly overlapping their opposite sides beneath: legs exceptionally slender, the hind femur over five times length of its greatest breadth, the hind tibial spur only about three-fifths length of corresponding metatarsus.

Males micropterous, with eyes relatively small, the gaster triangularly narrowed beyond the first large tergite, the hinder tergites beset with strong, almost erect setae . . . . . *acraconae* sp. n. (p. 126)

- Not as above: head shape more resembling Text-fig. 10 or sometimes Text-fig. 11: petiolar segment not or hardly embracing the nucha: gaster shaped otherwise, though the tergites may overlap their opposite sides beneath: legs not exceptionally slender.

Known males macropterous, having gaster not as in alternate . . . . . 9

- 9 Head of female abnormally broad for the genus, two and three-quarters to three times breadth of its median length: scutellum rather strongly convex . . . . . 10
- Head of female in most species not abnormally broad for the genus: scutellum of

normal convexity for the genus or flatter: not having the combination of characters of either species in the next couplet

11

- 10 Sides of upper face, as usual in the genus, reticulate: sculpture of mesoscutum and scutellum rather similar, consisting of reticulation that is relatively strongly outstanding, that is in large part coarse and tends to be longitudinal (Pl. 5, fig. 9): female gaster (Text-figs 5-6) not, as in most species, gradually more or less pointed but of masculine form, relatively broad and, apart from the ovipositor sheaths, very broadly rounded at apex, having the first large tergite relatively large and the epipleura almost or quite meeting mid-ventrally for a considerable length: wing trichiation normal: eyes with pilosity rather sparse but of moderate strength

*aspidomorphae* (Girault) (p. 128)

- Head shining all over, without distinct sculpture even on sides of upper face: sculpture of mesoscutum and scutellum dissimilar, that on scutellum very much the coarser: female gaster pointed, often strongly so: wing trichiation much denser than is usual in the genus: eyes not distinctly hairy ( $\times 100$ ): antennal scape but not tibiae mainly pale

*marjoriae* sp. n. (p. 131)

- 11 Pronotum having lateral angles prominent, as in *saulius* (Walker) (Bouček, 1965, pp. 11, 35-36), the collar strongly contracted behind its sharp anterior margin: notaular pits bearing a deep longitudinal impression, having a very sharp, almost transverse, anterior margin and bearing the main seta near inner corner almost immediately behind this margin, the interspace moderately to very strongly longitudinally striate: scutellum strongly longitudinally striate almost to apex, not appreciably more weakly so in mid line (Pl. 2, fig. 3)

*coffeicola* (Ferrière) (p. 132)

- Pronotum not having lateral angles thus prominent, the collar having sides on the whole no more than moderately narrowed: notaular pits not of this form, bearing the main seta about in or, more commonly, behind the middle

12

- 12 Lower face and clypeus uncommonly broad and flat for the genus (Text-fig. 3): mandibles elongate, sickle-shaped, with the lower tooth much longer and stronger than the upper (Waterston, 1915, fig. 5e): notaular pits rather shallow but very conspicuous, margined anteriorly by sharp continuations of the notauli and on inner side by converging striae which leave a comparatively narrow separation before the scutellum (Pl. 2, fig. 4)

*clinognathus* (Waterston) (p. 133)

- Otherwise: lower face and especially clypeus not so broad and flat: mandibles of more normal form: notaular pits more widely separated

13

- 13 Frontovertex delimited from upper face by a sharp transverse carina: propodeum having submedian carinae markedly bowed inward to middle then outward again: basalis of fore wing bearing several hairs, usually arranged in two rows: mesoscutum with a more or less developed median longitudinal impression in about hinder half

*arcuatus* sp. n. (p. 135)

- Frontovertex not delimited from upper face by a sharp carina, the head in profile rounded or with a mere fold in that position: propodeum having submedian carinae only slightly, if at all, bowed inward from base, either sub-parallel for part way back or, more usually, markedly divergent from near base: basalis of fore wing bearing a single row of hairs, normally two, or else bare

14

- 14 Scutellum rather strongly elongate-reticulate at sides, having a median band of moderate breadth finely but very distinctly reticulate, the pattern markedly different

15

- Scutellum with sculpture otherwise, either more uniform, sometimes narrowly weaker in mid line, or having a median band shining, smooth or with sculpture indistinct

17

- 15 Frontovertex one-third broader than its median length, with ocelli in a very distinctly acute triangle: first funicle segment, in side view, about one and three-quarters times length of its greatest breadth: propodeum (Waterston, 1915, fig. 10) having

microsculpture obvious  $\times 65$  between the submedian carinae and on hinder part of submedian areas: length nearly 2 mm: reared from a stalk-boring larva

*homoeus* (Waterston) (p. 136)

- Frontovortex over  $1\frac{1}{2}$  times breadth of its median length, with ocelli in a distinctly obtuse triangle: first funicle segment, in side view, not more than about one and a third times length of its greatest breadth: propodeum without such obvious microsculpture as described for alternate: length about  $1\frac{1}{2}$  mm or less: parasites in eggs . . . . . 16
- 16 Mesoscutum finely and regularly reticulate throughout, with notaular pits shallow and ill-defined (Pl. 3, fig. 5): pronotum including collar and frontovortex having similar reticulation: propodeum normally convex for the genus: cubital hair-row starting beyond speculum postbasale: frontovortex blue-green and thorax a dull green: parasite in eggs of Lepidoptera . . . . . *anastati* (Crawford) (p. 137)
- Mesoscutum extensively longitudinally striate-reticulate, notably between the notaular pits which are of moderate depth: pronotal collar more shining, with reticulation very fine, sometimes indistinct: propodeum rather strongly convex: cubital hair-row sparse immediately beyond basalis, then much denser, very distinctly arcuate: frontovortex with at least the ridges blackish bronzy and thorax blackish brown: parasite in eggs of Hemiptera . . . . . *cf. africanus* (Waterston) (p. 144)
- 17 Scutellum, except at sides, almost flat . . . . . 18
- Scutellum normally convex for the genus . . . . . 21
- 18 Scutellum almost regularly sculptured throughout, little if any less strongly so in mid line . . . . . 19
- Scutellum with a median band smooth or almost so . . . . . 20
- 19 Scutellum rather coarsely longitudinally striate, with about 17 striae above: occipital margin sharp to not much below level of top of eye: clypeus with a pair of lateral teeth and a small median raised projection: pronotal collar almost straight-sided, almost smooth behind the distinctly raised margin: first large tergite less than half length of gaster beyond petiole: hind tibial spur reaching well beyond apex of corresponding metatarsus: femora and tibiae testaceous, with only slight metallic colouring on hind femora . . . . . *praeveniens* sp. n. (p. 138)
- Scutellum much more finely and densely longitudinally reticulate to striate-reticulate; occipital margin sharp to below middle of eye: clypeus broadly almost truncate at apex: pronotal collar having sides sharply contracted, finely but very distinctly reticulate behind the weakly raised anterior margin, which does not delimit a sharp difference of sculpture: first large tergite about three-fifths length of gaster beyond petiole: hind tibial spur not or hardly reaching apex of corresponding metatarsus: legs except tarsi almost entirely dark blue-green . . . . . *modestus* (Masi) (p. 139)
- 20 Frontovortex about  $1\frac{1}{2}$  times the dorsal breadth of an eye, with ocelli in an almost equilateral triangle, and having reticulate microsculpture before the ocelli quite distinct  $\times 65$ : pronotum having neck elongate and collar very distinctly longitudinally striate-reticulate and having sides strongly expanded and then sharply contracted; petiolar segment above with longitudinal ridges very weak: first large tergite just over half length of gaster beyond petiole. Somali Republic, taken on cotton plant but biology unknown . . . . . *hirtellus* (Masi) (p. 141)
- Frontovortex over twice the dorsal breadth of an eye, with ocelli in a distinctly obtuse triangle, and having no sculpture distinct  $\times 65$  before the ocelli: pronotum having neck of normal length and collar without distinct sculpture and having sides rounded and slightly narrowed: petiolar segment above with rather strong longitudinal ridges: first large tergite about two-thirds length of gaster beyond petiole: parasite of lepidopterous stalk-borers. Sudan to Rhodesia and west to Sierra Leone . . . . . *furvum* (Gahan) (p. 142)



- 21 Very small species, of length little more than 1 mm.: legs before tarsi in greater part dull ochreous, with only light metallic colouring: antennal funicle having all segments quadrate or broader than long; nucha small, well rounded at apex: mostly dark, the green coloration obscure except on face and propodeum: parasitic in eggs . . . . . **telenomi** (Crawford) (p. 143)

— Larger species: legs before tarsi wholly metallic: nucha more or less emarginate at apex . . . . . 22

22 Length about 1.2 mm and thorax blackish brown: median band of scutellum narrow, having the longitudinally striate sculpture always markedly weaker but not always evanescent: gaster beyond petiole relatively short, the fore wings extending far beyond its apex: frontovertex having, in the two African species following, reticulation in large part distinct  $\times 65$ : first funicle segment little longer than broad . . . . . 23

— Larger species, mostly about 1.5 mm in length, often with thorax blue-green: median band of scutellum at least somewhat broader, shining throughout its whole length or with sculpture very indistinct: gaster elongate-ovate, the fore wings not extending far beyond its apex: frontovertex having reticulation, except on inter-ocular area, indistinct except in *afonigripes* nom. n. in which the third funicle segment in side view is very distinctly longer than broad: not as diagnosed for *africanus* (Waterston) immediately below, the ocelli in a strongly acute triangle (*afonigripes* group) . . . . . 25

23 Head markedly broader than thorax, strongly transverse, with ocelli in a slightly to distinctly obtuse triangle: propodeum relatively strongly convex, the spiracular area produced into a rounded lobe above the hind coxa: eyes not evidently hairy  $\times 100$ : parasitic in eggs . . . . . **africanus** (Waterston) (p. 144)

— Head not so transverse, with ocelli in a strongly acute triangle: propodeum no more than normally convex, the spiracular area produced into a prominent sharp tooth above the hind coxa: eyes evidently hairy  $\times 65$ : not parasitic in eggs . . . . . 24

24 Mesoscutum in middle of mid lobe weakly, finely and rather regularly reticulate: scutellum more convex: antennal scape less slender, about four times length of its greatest breadth: eyes distinctly hairy  $\times 65$ .  
S.E. Asia, introduced to Ivory Coast . . . . . **parvulus** (Ferrière) (p. 182)

— Mesoscutum in middle of mid lobe much less weakly and more coarsely elongate-reticulate: scutellum less convex: antennal scape slender, about six times length of its greatest breadth: eyes distinctly hairy  $\times 25$  . . . . . **vignae** (Risbec) (p. 146)

25 Frontovertex (Waterston, 1915, fig. 7b) rather dull, having reticulation quite distinct  $\times 45$  throughout: antennal funicle not evidently broadened in side view, the third segment usually very distinctly longer than broad (Waterston, 1915, fig. 2g): sculpture of mesoscutum stronger, of moderate strength in middle  
 . . . . . **afonigripes** nom. n. (p. 147)  
(= *nigripes* Waterston, 1915, non Lindeman, 1887)

— Frontovertex, except on inter-ocular area, more or less shining, having sculpture not or hardly distinct  $\times 65$ : antennal funicle evidently broadened in side view, the third segment about quadrate or broader than long (e.g. Waterston, 1915, fig. 2i): sculpture of mesoscutum much weaker . . . . . 26

26 Head less sharply narrowed behind eyes (Kerrich, 1970, fig. 2): eyes extremely finely and sparsely hairy: propodeum having nucha rather deeply emarginate at apex and spiracles larger, elongate-oval, little more than their longer diameter from margin of metanotum: petiolar segment little broader at base than long  
 . . . . . **vigintiquinque** Kerrich (p. 148)

— As in *afonigripes* nom. n. (Kerrich, 1970, fig. 1) head very sharply narrowed behind eyes: eyes less finely and sparsely hairy, the hairs very distinct  $\times 45$ : propodeum having nucha weakly emarginate at apex and spiracles very small, short-oval, much

- more than their longer diameter from margin of metanotum: petiolar segment much broader at base than long . . . . . 27
- 27 Frontovortex about twice the dorsal breadth of an eye: third funicle segment in side view little broader than long: mesoscutum more shining, as in *afronigripes* nom. n. having the seta arising from the notaular pit uncommonly strong, nearly reaching mid point of scutellum, the hind margin moderately sinuate
- amaurocoelus* (Waterston) (p. 149)
- Frontovortex about  $1\frac{1}{2}$  times the dorsal breadth of an eye: third funicle segment in side view much broader than long: mesoscutum duller, the seta arising from the notaular pit not uncommonly strong, not nearly reaching mid point of scutellum, the hind margin scarcely sinuate . . . . . *dipterae* (Risbec) (p. 150)

#### AFRICAN SPECIES NOT STUDIED

A comprehensive revision of the Risbec species is outside the scope of this paper, although certain have been studied. A number were described from males only, several from a single male. In such a case as *P. braconiphaga* Risbec, 1951 the whole of the material cited should be studied for the selection of a lectotype. Under some names the material cited has such diverse host-relations that I do not expect all series to belong to the same species even in this very versatile genus. From the figure, I would expect *P. ambilobei* to be a species of *Schizocharis* Kerrich.

#### SOUTHERN ASIATIC AND AUSTRALIAN SPECIES

##### *Pediobius occipitalis* sp. n.

(Text-figs 9, 13)

Head, seen from above (Text-fig. 9), well rounded and not, as in most species, strongly narrowed behind eyes, about two and a third times breadth of its median length, with occipital costa completely absent. Frontovortex about 1.4 times breadth of its median length and three times the dorsal breadth of an eye, with ocelli in a very obtuse triangle, small, the lateral about twice their own diameter from orbital margin: setae small, rather upstanding, inconspicuous in this view. Reticulation on frontovortex moderate to very fine but very weakly raised, on sides of upper face fine to very fine and weakly raised, and on lower face and clypeus very fine but quite distinct. Eyes moderately densely and rather strongly hairy.

Antenna having scape four and a half times and pedicellus twice length of its greatest breadth; funicle markedly broadened in side view, the first segment nearly as broad as long, the third about one and a half times as broad as long, the segments shortly petiolate at apex, the club excluding terminal spine a little longer than first two funicle segments combined.

Pronotal collar covered with reticulation that is fine to very fine but quite distinct, its sides almost parallel or somewhat expanded, its fore margin indicated but not at all raised. Notauli not sharp, deeply impressed anteriorly, much more shallowly so medially, running to shallow notaular pits that are not defined nor distinctively sculptured and which bear the main seta well forward of the hind margin: mesoscutum sculptured much as pronotum, covered with reticulation that is weakly raised but very distinct, merging from fine on mid lobe to very fine on parapsides: hind margin very gently curved. Scutellum about as broad as long, very weakly convex, finely longitudinally striate and not appreciably more weakly so in mid line, merging to reticulate near hind margin. Propodeum having submedian carinae relatively far apart at base, diverging gently at first, then much more strongly but in an inwardly-directed

curve, with median carina often rather strong, the whole upper surface very finely reticulate, the reticulation extremely weakly raised on anterior parts of lateral areas, which in consequence are rather shining, but much more definitely though not strongly so behind and on median area: nucha short, rather deeply emarginate: plicae laterales in almost hinder half produced into a strongly raised crest which overhangs the spiracular area: spiracles prominent, circular, almost as far from fore as from hind margin of propodeum.

Petiolar segment twice the basal breadth of its median length, with whole anterior margin sharply raised, with very fine but strongly outstanding reticulation and with irregular longitudinal ridges. Gaster beyond petiole very broad-oval, about a quarter longer than broad or less, the first large tergite slightly more than half its length, obscurely sculptured in greater part, the following tergites much more distinctly, finely and delicately reticulate.

Apical segment of all tarsi greatly swollen (Text-fig. 13), that of fore tarsi the most swollen. Hind tibial spur straight, reaching slightly beyond apex of corresponding metatarsus.

Head, thorax and sides of propodeum very dark green to blackish, with weak metallic reflection: propodeum above, though markedly brighter, a rather dark blue-green. Antennae dark blue-green. Gaster blackish brown, the first large tergite dark blue-green in less than basal half, the following tergites with extremely fine apical margins dark blue-green. Legs very dark green to blackish, the tibiae more prominently blue-green, often pale at extreme apex, the tarsi pale testaceous to stramineous, with the apical segment darkened.

Holotype ♀. HONG KONG: New Territories, Tai Lung, 13.iv.1964, *ex* pupa of Pine Shoot Borer, *Dioryctria splendidella* Herrich-Schäffer (Pyralidae, Phycitinae), *per* H. Y. Lee, Agriculture and Fisheries Department.

Paratypes. HONG KONG: 2 ♀♀, 4.vi.1962, 5 ♀♀, 13.iv.1964, same data as holotype. THAILAND: Baw Luang, 3 ♀♀, 10.xii.1968, *ex* *Rhyacionia cristata* Walsingham (Tortricidae), *per* CIBC.

One male is present in the series from Thailand. It agrees in most respects with the female, but the fore femora are very stout, and the setae near apex of gaster uncommonly strong.

This is so very differently characterized from most species of *Pediobius* that it seems likely at some stage to be placed in a separate genus.

### *Pediobius inexpectatus* sp. n.

Head, seen from above, about 2.4 times breadth of its median length. Frontovortex about one and a quarter times or less the breadth of its median length and about twice the breadth of an eye, with ocelli in a distinctly acute triangle; rather strongly reticulate throughout, somewhat more finely so before the lateral ocelli but not more weakly so beside and behind them. Inter-scribal prominence and genae moderately reticulate: sides of upper face rather strongly so. Carinae from lateral ocelli to orbital margins well developed: occipital carina strong but comparatively short, not extending far below level of top of eyes. Eyes, seen from above, distinctly emarginate in hinder half of inner margin, in facial view extending below level of toruli, finely and rather sparsely hairy.

Antenna having scape narrow but obviously broadened in about apical half, over five times length of its greatest breadth: funicle slightly broadened in side view, the segments moniliform, very distinctly petiolate apically, the first excluding petiole almost oval, about one and a half times as long as broad, the second and third almost quadrate, and club, excluding terminal spine, over one and a half times the length of either.

Sides of pronotal collar slightly to moderately narrowed. Notauli having sharp anterior margin, which continues as a sharp inner margin of the notaular pits running to not far from hind margin of mesoscutum, the notaular pits rather shallow, not defined on outer side, and



bearing the main seta rather near inner hind corner: mesoscutum strongly reticulate on mid lobe and greater part of parapsides, more finely so anteriorly and near outer margins: hind margin almost rectilinear between inner corners of axillae. Scutellum rather weakly convex, almost striate very near mid base but in greatest part strongly reticulate, much as on large part of mesoscutum but in part more elongately so, having a shining hind margin projecting backward over a large part of the metascutellum. Propodeum having submedian carinae close together at base, whence rather weakly though quite distinctly divergent for about two-thirds their length, then more strongly so, extremely finely reticulate and with no distinct median carina between them: nucha broadly and rather weakly emarginate at apex: spiracles small, elongate, the spiracular area, seen from directly above, not falling so steeply as in most species, produced into a strong crest above the hind coxa.

Petiolar segment having sides strongly expanded to base, there over one and a half times breadth of its median length, with anterior margin sharp, rather strongly raised in middle and to corners, very finely reticulate above, with two or more weak and incomplete longitudinal keels from mid base. Remainder of gaster broad-oval, about one-fifth longer than its greatest breadth, the first large tergite about half its length, comparatively strongly reticulate on dark part of first large tergite, increasingly finely so on following tergites.

Hind tibial spur slightly curved, extending slightly beyond apex of the relatively short metatarsus.

Head medium green, with overspread of brassy to bronzy, slight on frontovertex, often much stronger on upper and lower face, genae and clypeus. Antennae a more or less dull blue-green, with strong brassy to bronzy reflections. Thorax and propodeum medium green, often distinctly brighter than frontovertex, with light brassy and occasional bronzy reflections, the pleura with stronger reflections. Gaster dull bronzy, the first large tergite medium green in rather more than basal half, this and the following tergites with narrow, medium green apical margins. Legs medium to blue-green, with rather strong brassy to bronzy reflections.

Holotype ♀. NEW GUINEA: Morobe District, Bubia, 18.ix.1968, *ex Melanitis constantia* (Cramer) (Lep., Satyridae, a pest of sugar cane), C. S. Li, *per* Dept. Agriculture, Stock & Fisheries (ANIC, Canberra).

Paratypes. NEW GUINEA: 11 ♀♀ (same data as holotype); 11 ♂♂ present in the series. Paratypes and males in BMNH and ANIC, Canberra.

This has more the general facies of a European than of a far eastern tropical species. Among the species treated in this section of the present paper, it most resembles *illustris* (Waterston) and *acantha* (Walker), yet there are very distinct differences elaborated in the above description and subsequent key. It was necessary partly to dissect one of the female specimens to observe with accuracy the proportions of the petiolar segment. Since this is obviously transverse, and the male has inflexed epipleura, the species would run with *illustris* rather than *acantha* from couplet 27 in the key of Bouček (1965) (cf. comment in treatment of *acantha* below). The males of this species are cupreous, whereas those of *acantha* are blue-green.

### *Pediobius illustris* (Waterston)

*Pleurotropis illustris* Waterston, 1915 : 345, 357, 362-4. Holotype ♀, IRAN: Ispahan (BMNH) [examined].

*Pediobius illustris* (Waterston) Bouček & Askew, 1968 : 94.

Head, seen from above, two and three-quarter times breadth of its median length, deeply emarginate behind. Frontovertex one and a half times breadth of its median length and more

than twice the dorsal breadth of an eye, with ocelli in about a right-angled triangle; rather strongly and rather regularly reticulate almost throughout. Upper face moderately reticulate on sides and inter-scrabal prominence. Eyes, seen from above, distinctly emarginate in hinder half of inner margin, and in facial view relatively strongly emarginate, extending very distinctly below level of toruli, sparsely and rather finely hairy.

Antenna having scape elongate and narrow, about seven times length of its greatest breadth, about reaching median ocellus: funicle little broadened, having first segment about twice and third about one and a half times, length of their greatest breadth in side view, the segments very shortly petiolate at apex.

Sides of pronotal collar strongly rounded and slightly broadened. Notauli sharply impressed anteriorly and medially, running to notaular pits that are broad but shallow and ill-defined, and bear the main seta near inner side about two-fifths the way forward: mesoscutum strongly and almost regularly reticulate, though more finely so in the notaular pits, the hind margin moderately sinuate. Scutellum rather less strongly reticulate than the mesoscutum and becoming gradually more finely so toward the front (Waterston, 1915, fig. 13): axillae rather weakly and indefinitely and axillulae finely reticulate. Propodeum (unfortunately slightly damaged in the unique type) having submedian carinae subparallel about half way back then diverging at about  $45^\circ$  (Waterston, 1915, fig. 13) and with a distinct carina extending on to the nucha, which is broadly emarginate at apex: spiracles almost circular, the spiracular area produced into a small, blunt ridge above the hind coxa.

Petiolear segment strongly transverse, almost twice as broad as long, rather finely reticulate, angled at sides but with no longitudinal keel above, the anterior margin sharply but not strongly raised. First large tergite less than one-third length of gaster beyond petiole and almost smooth above: reticulate sculpture on all following tergites delicate but very distinct.

Hind tibial spur rather short and straight, reaching about mid length of metatarsus.

Large species: length over 2 mm.

Head blue-green to greenish blue above, broadly overspread with bronzy, dull blue-green below. Antennae having scape and pedicellus brownish black with moderate greenish blue reflection, and flagellum medium brown with very weak metallic reflection. Thorax and propodeum bright blue-green, with weak brassy reflections. Gaster dull bronzy, the first large tergite greenish blue on whole of upper surface, the four following tergites greenish blue along apical margins. Legs blue-green, the mid and hind tibiae pale at apex: mid and hind tarsi stramineous, the apical segment darkened, and the fore tarsi darkened.

Redescribed from the unique holotype, IRAN.

### *Pediobius acantha* (Walker)

*Entedon acantha* Walker, 1839 : 107-8. Holotype ♀, ENGLAND: London (BMNH) [examined].

*Pediobius acantha* (Walker) Bouček, 1965 : 10-4, 67-9.

Asiatic material examined. IRAQ: Baghdad, 1 ♀, 5.iv.1964, *ex* leaf-miner on turnip (*A. Awasi*) (det. J. A. J. Clarke, 1964); 1 ♀, 9.v.1970, *ex* leaf-miner on *Erigeron* (*per* Divn. Ent.). PAKISTAN: Rawalpindi, 3 ♀♀, 15-17.v.1961, *ex* dipterous leaf-miner on *Arundo donax* (*per* CIBC); Murree, 6 ♀♀, 25.v.1969, *ex* *Phytomyza* sp. on *Pisum sativum* (*per* CIBC). INDIA: Mysore, Bangalore, 3 ♀♀, 20.xii.1963 '*ex* Jowar leaf-miner' (? *Marasmia trapezalis* Guenée, a leaf-roller on *Andropogon sorghum*, the Indian millet) (*per* CIBC). Males also reared in all the above series. Most of this material in BMNH.

This form is so similar to *illustris* (Waterston) that I had taken it to be the same species, regarding Waterston's type as an exceptionally well developed specimen.

My colleague Dr Bouček pointed out, however, that the different proportions of the petiolar segment would lead from different alternates in couplet 27 of his European key (1965, p. 13). There is also the difference in relative length of the first large tergite, but Bouček records much variation in this in the large European material he examined. I find the following other differences from *illustris*: ocelli often in obviously less than a right-angled triangle, antennal scape relatively shorter and broader, not nearly reaching the median ocellus, sides of pronotal collar slightly narrowed, propodeum without a median carina. The first large tergite is one-third or more, often two-fifths, length of gaster beyond petiole, but not as much as half in any of the above-mentioned material.

### *Pediobius longisetosus* sp. n.

Head, seen from above, two and two-thirds times breadth of its median length. Frontoververtex one and a half times breadth of its median length and over twice the dorsal breadth of an eye, with ocelli in a right-angled triangle, the lateral much more than their longer diameter from orbital margin; with sculpture very distinct throughout, but rather weak and very irregular. Reticulation on sides of upper face weak but rather wide-meshed, on lower face and clypeus weak and fine but distinct. Eyes strongly but rather sparsely hairy.

Antenna having scape about five times length of its greatest breadth: funicle only slightly broadened in side view, the first segment about one and a half times as long as broad, the third distinctly longer than broad, the segments shortly but distinctly petiolate at apex.

Pronotal collar short, rather finely longitudinally striate above, moderately narrowed at sides. Notauli deeply but not sharply impressed, leading to notaular pits that are rather deep but not well defined, and which bear the main seta anteriorly: mid lobe of mesoscutum coarsely longitudinally striate except for a pair of anterior triangular areas situated just inward of the notauli, which bear outstanding fine reticulation: parapsides having striation somewhat less coarse, running diagonally toward and into the notaular pits: hind margin strongly sinuate. Axillae with outstanding reticulation. Scutellum coarsely longitudinally striate almost throughout, with moderate outstanding reticulation near hind margin. Propodeum having submedian carinae rather widely separated at base, moderately divergent then curving round and inward round the nucha, which is moderately emarginate at apex, having fine striation and reticulation between them, strongly shining beside them: spiracles small, circular, the spiracular area, seen from above, produced into a small tooth above the hind coxa.

Petiolar segment much broader than long, with anterior margin strongly raised in middle, very finely elongate-reticulate. Gaster beyond petiole comparatively strongly hairy, the first large tergite three-fifths its length, sparsely and irregularly punctate especially on the bronzy part, the remaining tergites extremely delicately sculptured.

Wing fringe exceptionally long for the genus, the cilia at anal angle about a quarter, the seta at junction of marginal and radial veins a third, the greatest breadth of fore wing. Hind tibial spur strong, reaching well beyond apex of corresponding metatarsus, the apical segment of all tarsi strong.

Setae exceptionally long and strong for the genus, the longest head seta, which arises just before the occipital margin, nearly the length of an eye, seen from above, the scutellar seta well over half the greatest breadth of fore wing.

Frontoververtex steely green, blackish brown on inter-ocellar area: head in facial aspect steely green, largely overspread with blackish brown to bronzy. Antennae largely dark blue-green. Thorax and propodeum dark blue-green, with extensive overspread of bronzy. Gaster dull



bronzy, the first large tergite blue-green in more than basal half. Legs blue-green, the tarsi stramineous, with the apical segment infusate.

Unique holotype ♀. NEW HEBRIDES: unlocalized, 1935, 'ex larva of Lymantriid on cocoa-tree' (*M. Risbec*) (BMNH).

*Pediobius ptychomyiae* (Ferrière) comb. n.

*Pleurotropis ptychomyiae* Ferrière, 1940 : 137-8. Holotype ♀, JAVA: Res. Madioen, Patjitan (BMNH) [examined].

Head, seen from above, about two and a half times breadth of its median length. Fronto-vertex about a quarter broader than its median length and twice the dorsal breadth of an eye, with ocelli in about a right-angled triangle; moderately strongly reticulate, the meshes more transverse beside the median ocellus and smaller in inter-ocellar area, not much less strong beside and behind the lateral ocelli. Sides of upper face moderately reticulate. Eyes rather finely and densely hairy.

Antenna (Ferrière, 1940, fig. 5) having scape about four to five times length of its greatest breadth: funicle markedly broadened, having first segment about one and a half times length of its greatest breadth in side view and third about quadrate, the segments very distinctly petiolate at apex.

Sides of pronotal collar emarginate, very little narrowed. Notauli not deeply impressed anteriorly, running to rather triangular shaped notaular pits, which are not bordered on inner or outer side, and which bear the main seta less than one-third the way forward: mid lobe of mesoscutum and parapsides strongly reticulate, the reticulation merging to striation between and in the notaular pits, the reticulation on parapsides not differing markedly from that on mid lobe: hind margin weakly sinuate. Scutellum rather strongly and regularly longitudinally striate almost throughout, tending to be weakly reticulate narrowly in mid line. Propodeum having submedian carinae approximately parallel for more than half way back, then diverging at about 45° or usually distinctly less, and with no distinct median carina: nucha small, broadly emarginate at apex: spiracles short-oval, the spiracular area having one or two transverse rugae, as seen from above produced into a prominent sharp tooth above the hind coxa.

Petiolear segment much broader than long, very finely reticulate, with some longitudinal ridges. Gaster beyond petiole moderately elongate and markedly pointed towards apex, the first large tergite a little less than half length of gaster beyond petiole, the gaster delicately reticulate on dark part of first large tergite and increasingly finely reticulate on those following.

Hind tibial spur slightly curved, reaching a little beyond apex of metatarsus.

Head dark blue-green to blue, sometimes with bronzy or red-violet reflection. Antennae having scape stramineous, and pedicellus and flagellum pale brown, with dark green coloration more or less developed. Thorax and sides of propodeum dark brown, with weak brassy green sheen, or else dark blue-green, with bronzy reflection, the ridges of the reticulations and striae brown. Propodeum above, and usually the shining pronotal collar, a brighter blue-green. Gaster bronzy black, the first large tergite, except for mid apical patch, blue-green to greenish blue. Coxae and femora brownish black to brown, often with blue-green reflection or the hind femora wholly blue-green: tibiae pale testaceous to stramineous, the hind tibia with a little darkening near base, and tarsi stramineous, dark at extreme apex.

Material studied. JAVA, SUMATRA and WEST MALAYSIA, holotype and numerous female paratypes: male paratypes are also available. Not since received by CIE.

BIOLOGY (see van der Vecht 1950). Reared as a secondary parasite of *Artona catoxantha* Hampson through two species of Tachinidae and very occasionally through a species of *Apanteles*.

*Pediobius bethylicidus* sp. n.

Head, seen from above, rather more than twice breadth of its median length. Frontovortex about one and a quarter times breadth of its median length and two and a half times breadth of an eye, with ocelli in a slightly acute triangle; with reticulation moderately strong and almost regular, beside and behind the lateral ocelli much more finely so but still decidedly outstanding. Sides of upper face rather finely reticulate, merging to finely so on cheeks: lower face and clypeus very finely but quite distinctly reticulate. Eyes rather weakly but rather densely hairy.

Antenna having scape about four times length of its greatest breadth: funicle strongly broadened in side view, the first segment a little longer than broad, the second a little and third much broader than long, and basal club segment much broader than third funicle segment.

Pronotal collar very finely, indistinctly reticulate, not smooth and shining, its sides strongly narrowed and strongly rounded. Notauli very fine, sharply impressed, often unusually transverse, leading to notaular pits that are rather well-defined and rather deep, are separated by an interspace about half the width of either, and bear the main seta much nearer inner margin and about a third the way forward: mid lobe of mesoscutum and parapsides with reticulation about as on frontovortex, merging to some rather indistinct striation between the notaular pits which are extremely finely reticulate, dull: hind margin rather weakly sinuate. Axillae finely reticulate. Scutellum rather strongly and regularly striate almost throughout, though more weakly and densely so near mid line, merging to reticulate near hind margin. Propodeum having submedian carinae sub-parallel or, rather, bowed very slightly inward for more than half way back, then diverging at nearly  $45^\circ$ , and with median carina absent or merely indicated: nucha very short, broadly and slightly to moderately emarginate at apex: spiracles almost circular, the spiracular area, seen from above, produced into a very sharp tooth above the hind coxa.

Petiolar segment much broader than long, finely reticulate, with longitudinal ridges more or less distinct. Remainder of gaster very broad-oval, almost flat above, the first large tergite almost two-thirds its length, delicately reticulate on the dark part, the following tergites increasingly finely so.

Hind tibial spur almost straight, reaching just beyond apex of metatarsus.

Frontovortex blue-green, usually with pale brassy to bright bronzy reflections though occasionally darker: face, clypeus and genae a darker blue-green, with duller, often bronzy, overspread. Antennae with scape pale testaceous, and with pedicellus and flagellum pale brown below, darker and with weak metallic reflections above. Thorax and propodeum dark blue-green, usually with pale brassy to bronzy reflections, though these often markedly less evident than on frontovortex. Gaster brown, weakly shining, the first large tergite blue-green in, usually, less than basal half. Legs very dark blue-green, the femora often pale at apex, the tibiae and tarsi pale testaceous, the apical tarsal segment slightly darkened.

Holotype ♀. INDIA: Uttar Pradesh, Lucknow, i.1963, 'secondary parasites of pupae of *Parasierola* sp.' (Bethylidae) 'on army worm' (? *Sesamia inferens* Walker, Phalaenidae), per P. N. Avasthy, Indian Institute of Sugarcane Research (BMNH).

Paratypes. INDIA: 15 ♀♀, same data as holotype; Lucknow, 3 ♀♀, 2.xii.1965, 'secondary parasite of army worm', per A. K. Kalra, Indian Institute of Sugarcane Research; Gola, 2 ex., ii.1971, 'ex larva on sugar', per CIBC; W. Bengal, Plassey, 2 ♀♀, 27.xi.1969, ex cocoon *Goniozus* sp. (Bethylidae) associated with sugar, per CIBC.

*Pediobius foveolatus* (Crawford) comb. n.

(Pl. 4, fig. 7)

*Pleurotropis foveolatus* Crawford, 1912 : 7. Holotype ♀, INDIA: Mysore, Bangalore (USNM, Washington).

*Pleurotropis mediopunctata* Waterston, 1915 : 345, 348, 353, 357-60. LECTOTYPE ♀, NIGERIA: Ibadan (BMNH), here designated (p. 124) [examined]. Here regarded as subspecies.

*Pleurotropis epilachnae* Rohwer, 1921 : 126-7. Holotype ♀, INDIA: Madras, Coimbatore (USNM, Washington). **Syn. n.**

*Pleurotropis foveolatus* Crawford; Ferrière, 1933 : 96.

*Pleurotropis epilachnae* Rohwer; Ferrière, 1933 : 96.

*Pleurotropis mediopunctata* Waterston; Masi, 1940 : 301-2.

*Pediobius epilachnae* (Rohwer) Burks, 1966 : 35.

*Pediobius epilachnae* (Rohwer); Baltazar, 1966 : 116.

Head, seen from above, rather variable in proportion but always relatively broad, two and a half to three times breadth of its median length. Frontovortex usually about one and a half times breadth of its median length and more than twice the dorsal breadth of an eye, with ocelli in a slightly to very distinctly obtuse triangle; rather strongly reticulate, though more finely so beside and behind the lateral ocelli. Sides of upper face moderately to rather strongly reticulate. Eyes moderately strongly and densely hairy.

Antenna having scape hardly broadened, about six times length of its greatest breadth: funicle having first segment about two and a half times length of its greatest breadth and third about quadrate, the segments distinctly petiolate at apex: the proportions of the funicle segments are often less dissimilar in smaller specimens.

Sides of pronotal collar strongly narrowed. Notauli sharply impressed and with sharp anterior margin, which continues as an anterior margin of the broad-oval notaular pits; these bear deep bronze-coloured longitudinal impressions, are usually bordered by moderate striae on inner and are not sharply bordered on outer side, and bear the main seta about one-third the way forward, the space between them being very much narrower than a pit: mid lobe of mesoscutum with reticulation of moderate strength and rather regular to rather coarse, tending especially to be coarser in the darker specimens, rather irregularly striate between the notaular pits, the parapsides much more finely striate to reticulate: hind margin strongly sinuate. Scutellum rather strongly striate-reticulate in greater part, merging to more regular reticulation in about apical third, narrowly in mid line in anterior half much more finely reticulate. Propodeum having submedian carinae diverging weakly from base and then more strongly but at much less than 45°, and often with a very weak median carina between them: nucha rather strongly convex, almost truncate or rather weakly emarginate at apex: spiracles elongate-oval, the spiracular area produced into a sharp tooth above the hind coxa.

Petiole segment about as long as broad in Asiatic material, about a quarter longer in African, with anterior margin strongly raised, finely to very finely reticulate, sometimes with traces of longitudinal ridges but these not nearly percurrent. First large tergite about half length of gaster beyond petiole or more, dark part of first large tergite with reticulate sculpture varying from delicate but very distinct to evanescent, and following tergites with extremely delicate reticulate to trans-striate sculpture but prominent smooth margins.

Hind tibial spur curved, reaching well beyond apex of metatarsus, except in South African material studied.

Coloration of form described as *epilachnae* (Rohwer) – head mainly blue-green to greenish blue above, overspread with bronzy on triangle above frontal fork and on upper face, blue-green to blue-black below, the clypeus blue-green. Antennae blue-green, the scape and pedicellus rather darker. Thorax and sides of propodeum dull blue-green, with brassy and bronzy reflections, the propodeum above a rather brighter blue-green. Gaster dull bronzy to blackish brown, the first large tergite blue-green above in about basal two-thirds, the hinder tergites often with extremely fine, sea-green hind margins. Legs dull blue-green, the tarsi stramineous,



darkened towards apex, but sometimes the legs are in part a brighter green, with the tibiae paler towards apex.

Form described as *foveolatus* (Crawford) differs as follows: head a darker blue-green or blue, or more overspread with bronzy, the clypeus often not green. Thorax and sides of propodeum blackish brown with bronzy reflection, the propodeum above, pronotal collar and propleura blue-green, or the thorax and propodeum mainly blue, with bronzy reflection.

In one Queensland series, one specimen has the frontovertex and thorax markedly brassy: in the other the males, instead of being coloured much like the females as in most series of the aggregate species studied, are strongly copper-coloured. Middle African material is mainly dark blue-green, with bronzy reflection notably before the occiput, and the hinder tergites usually have comparatively broad, sea-green hind margins.

South African material appears to differ in structure as well as colour. In the series from Natal the blue-green is replaced by red-violet, with some turquoise coloration: in that from Cape Province the thorax is greyish black. In both, the hind tibial spur is straighter and does not reach the apex of the metatarsus: in the Cape Province series the hind margin of the mesoscutum is weakly sinuate and the sculpture of the thorax, though of pattern characteristic of the species, is relatively weakly outstanding.

This species is so variable as to be difficult to characterize. It is no wonder that Rohwer (1921), on the material available, presumed that he had a species distinct from *foveolatus* Crawford, considering the size and the striking colour difference of the thorax. On a visit to North America in 1956, I had with me specimens regarded as typical of the two forms and made comparisons with paratype material. Since then I have endeavoured to determine Asiatic specimens received as one form or the other but, with the accretion of more material, having increasing difficulty. The sculpture of the scutellum, given as a difference by Rohwer and repeated by Ferrière (1933), is found to be of essentially the same pattern in the two forms, though the reticulation on the mid lobe of the mesoscutum is weaker, less regular and wider meshed in series of smaller specimens. Generally, the head is uncommonly broad for a *Pediobius* species, but this feature is much less marked in some series.

Discussing the question by correspondence with Dr B. D. Burks, I found that his experience had so closely paralleled my own that I sought his permission to quote. He wrote 'I will make no objections to the synonymy of *foveolatus* and *epilachnae*. The only difference I have been able to find between them is color—the type series of the two certainly differ in color, but subsequent material is harder to divide up. This has been successfully introduced into North America, so I have to contend with it quite a lot. I have been using *foveolatus*, the older name.'

My colleague Dr B. R. Subba Rao, who has field experience of parasites of *Epilachna* in India, told me he did not believe that *foveolatus* and *epilachnae* were separate species.

Species of *Pediobius* have almost always been studied on a regional basis, and it does not appear that African and Asiatic parasites of *Epilachninae* have previously been compared. Fewer series are available from middle Africa and less variation

has been noted. In Asiatic material, however, the female petiolar segment is about quadrate whereas in African material it is about a quarter longer than broad. It seems best at the present time to treat the middle African material as having subspecific rank. The South African series may represent a further subspecies or incipient species, but much more material needs to be studied before this can be established on a satisfactory basis.

No other Asiatic species has been seen which would be difficult to separate from *foveolatus*, but the variability of the species as found in Asia and Australia does render more difficult the separation from the African form of the closest related species *neavei* (Waterston). All African series seen do have the characteristic broad head, and the reticulation has a marked tendency to be transverse beside the median ocellus. In *foveolatus* the eyes are described as moderately strongly and densely hairy, in *neavei* as densely hairy; but although this difference has not been quantified, it is readily appreciable when the two species are directly compared. That the tibiae are sometimes pale at apex invalidates Waterston's sole key character.

Material studied. Asiatic and Australasian. IRAQ: Abu Ghaib, 2 ♀♀, 11.x.1955, ex larva *Henosepilachna chrysomelina* (Fabricius), Abid Isa (compared 1956 with cotypes of *epilachnae* Rohwer). PAKISTAN: Lyallpur, 7 ♀♀, 15.vi.1968, ex pupa *Epilachna* sp., per CIBC. NEPAL: Katmandu, 2 ♀♀, 8.viii.1966, ex *Epilachna 28-punctata* Fabricius, per Dept. Agric. INDIA: Madras, Coimbatore, 1 ♀, 2.viii.1968, ex larva *Epilachna* sp. on brinjal, per CIBC; Orissa, Bhubaneswar, 3 ♀♀, 28.vii.1955, ex larva *Epilachna* sp. on brinjal, per CIBC; Orissa, Bhubaneswar, 3 ♀♀, 28.vii.1955, ex larva *Epilachna* sp., S. G. Sen Gupta; W. Bengal, Kalimpong, ex pupa *Epilachna* sp. on *Memordica charantica*, per CIBC. CEYLON: Peradiniya, 2 ♀♀, 10.v.1924, ex pupa *Epilachna 28-punctata* Fabricius, on *Memordica charantica* (J. C. Hutson); Tinnavelle, 1 ♀, 17.vii.1961, ex *Epilachna* pupa, ? captor. THAILAND: 2 ♀♀ (ref. A940), Ariant Manjikul. WEST MALAYSIA: Selangor, Kuala Lumpur, 3 ♀♀, 15.iv.1931, ex 'Epilachna 12-punctata', 4 ♀♀, 14.ix.1936, ex *Epilachna indica* Mulsant, per Divn. Ent. Dept. Agric. CHINA: Yunnan, Kunming, ♀♀, 'ex larva of 2061', C. L. Liu (compared 1956 with cotypes of *foveolatus* Crawford). NEW GUINEA: Papua, 2 ♀♀, 7.iii.1970, ex pupa *Henosepilachna guttatopustulata* Fabricius, per CIBC. AUSTRALIA: Queensland, Brisbane, Samford, 8 ♀♀, 23.v.1960, ex larva *Henosepilachna sparsa* (Herbst) subsp. *26-punctata* (Boisduval) (E. P. Warwick & G. O. Stride); Brisbane, 2 ♀♀, 1.1971, ex Coccinellid pupa, per W. R. Smith.

African. ETHIOPIA: Ada Scioa, Bitscioftu, 1 ♀, ex 'Coccinellid no. 59' (G. Jannone); former Eritrea, Asmara, 2500 m., ♀♀, 15.ix.1946, ex pupa *Epilachna similis* Thunberg subsp. *tellini* Weise (G. de Lotto). KENYA: Nanyuki, 4 ♀♀, v.1968, ex *Epilachna* sp. (R. G. Allan). NIGERIA: Ibadan, 4 ♀♀, vii.1913, ex pupa *Epilachna* s.l., sp. (det. R. D. Pope) (W. A. Lamborn) (syntypes of *mediopunctata* Waterston). GHANA: Lawra, 4 ♀♀, 12.x.1939, ex *Henosepilachna chrysomelina* Fabricius, ? captor. ZAIRE: Kivu, Lubero, 4 ♀♀, 1949, 'parasite de Coccinellidae' (P. Lefèvre). SOUTH AFRICA: Natal, 1 ♀, 1960, ex pupa *Epilachna similis* Thunberg, per F. J. Simmonds; Cape Province, Alexandria, 2 ♀♀, 10.x.1958, ex *Epilachna hirta* Thunberg (J. S. Taylor).

*Pediobius elasmii* (Ashmead)

(Pl. 4, fig. 8)

*Asecodes elasmii* Ashmead, 1904b : 138. LECTOTYPE ♂, PHILIPPINES: Manila (USNM, Washington), here designated [examined].

*Pleurotropis lividiscutum* Gahan, 1922 : 49. Holotype ♀, SUMATRA: Padang (USNM, Washington). **Syn. n.**

*Pleurotropis lividiscutum* Gahan; Ferrière, 1933 : 96.

*Pleurotropis elasmii* (Ashmead) Gahan, 1951 : 170.

*Pediobius elasmii* (Ashmead) Baltazar, 1966 : 116.

Head, seen from above, 2.2 to 2.4 times breadth of its median length. Frontovortex slightly to about one-third broader than its median length and 2.0 to 2.4 times the dorsal breadth of an eye, with ocelli in an acute triangle; rather strongly to strongly reticulate almost throughout, but with reticulation finer and less strongly raised just above frontal fork. Sides of upper face moderately reticulate; lower face and clypeus, as normally in the genus, almost smooth, with sculpture generally indistinct, though occasionally there is a patch of weak but distinct reticulation to either side of the clypeus. Eyes moderately strongly and densely hairy, in facial view relatively strongly emarginate.

Antenna having scape distinctly broadened to about two-thirds its length, about three times length of its greatest breadth: funicle markedly broadened, having first segment about one and a half times length of its greatest breadth and third distinctly transverse in side view, the segments very distinctly petiolate at apex: club having two segments, the second very much the smaller, and a terminal spine.

Sides of pronotal collar slightly to moderately narrowed, very little rounded. Notauli moderately but not at all sharply impressed, running to notaular pits of moderate breadth and depth that are hardly defined outwardly but are bordered by a strong stria on inner side, and bear the strong main seta about in middle: mid lobe of mesoscutum with moderate, transverse reticulation in front, merging to stronger reticulation in middle and longitudinal striation which diverges round the raised part before the hind margin, which is strongly emarginate: parapsides moderately reticulate at sides, this merging to striation which runs into the notaular pits. Scutellum strongly longitudinally striate at sides, merging to reticulate behind: the broad median band is usually shining and almost smooth in anterior half or more, with the sculpture evanescent, but occasionally it has reticulate sculpture weak but distinct throughout. Propodeum having submedian carinae not very close, diverging rather weakly to moderately from base, and usually with no distinct median carina: nucha dull, sharply emarginate at apex: spiracles oval, the spiracular area, seen from above, produced into a prominent, sharp tooth above the hind coxa.

Petiolar segment nearly twice as broad as long, very finely reticulate, with weak longitudinal ridges anteriorly. First large tergite less than half length of gaster beyond petiole, the sculpture on dark part of this and the following tergites extremely delicate.

Hind tibial spur curved, reaching well beyond apex of metatarsus.

Head dark blue-green, with greater or lesser amount of bronzy and brassy reflection, often red-violet before the median ocellus, the ridges of the reticulations dark, sometimes having the upper face dull bronzy. Antennae blue-green. Sides of thorax and propodeum blue-green to blue-black and bronzy. Upper surface of thorax and propodeum blue-green to greenish blue, on mesothorax usually merging to bronzy laterally, occasionally with red-violet reflection; but sometimes the mesoscutum and scutellum are blackish brown. Gaster dull bronzy, the first large tergite dark blue-green to greenish blue, often with red-violet reflection, on about basal half above. Legs dark blue-green, the tibiae often a brighter green: tarsi pale stramineous, darkened towards apex. One specimen from Malaya has the frontovortex, thorax above and base of gaster mainly red-violet.

Redescribed from the following. INDIA: Mysore, Mandya, 10 ♀♀, 17.vii.1970, *ex* pupae of *Proceras indicus* Kapur (Pyralidae, Crambinae), *per* Deccan Sugar Co.,



1 ♀, 28.viii.1964, *ex Sarcophaga* sp., *per* CIBC; Madhya Pradesh, Jagadapur, 2 ♀♀, 5.iv.1962, *ex* Saturniid cocoon (*K. K. Verma*). CEYLON: Kowlwewa, 3 ♀♀, viii.1962, on *Manatha albipes* (*E. Dharmaraju*); Colombo, Museum garden, 2 ♀♀, 2.iii.1971, *per* W. T. T. Gunarwardene. THAILAND: Bangkok, Noi, 3 ♀♀, 25.x.1927, 'ex cocoon of caterpillar on *Erythrina* sp.' (*W. R. S. Ladell*). WEST MALAYSIA: Batu Gajah, 2 ♀♀, 20.iii.1924, on larvae of *Artona catoxantha* Hampson (*Zygaenidae*) (*G. H. Corbett & B. A. R. Gater*); Menglerubu, 3 ♀♀, 14.iv.1934, on *A. catoxantha* Hampson, *per* Dept. Agric.; Selangor, Kuala Lumpur, 4 ♀♀, 22.vi.1932, *ex* pupa *Lamprosema camphorae* Tams (*Pyraustidae*), *per* Dept. Agric.; Kuala Lumpur, Carruthers Road, 5 ♀♀, 29.x.1954, *ex* Tachinid puparia from cocoons of *Attacus atlas* L. (*Saturniidae*) (*I. J. Wyatt*). SUMATRA: Pematang, Siantar, 4 ♀♀ (1 ♂), 9.ix.1931, 'bred from cocoons of parasite 126' and 'ex puparium of Tachinid parasite 77' (*R. I. Nel*). JAVA: Bogor, 1 ♀, 8.iv.1919 'reared from Braconid cocoons' (*S. Leefmans*) (paratype no. 24657, USNM, Washington); Magelang, 2 ♀♀ (2 ♂♂), iv.1938, *ex* *Apanteles hilaridis* Rohwer (*Tjoa & R. Awibowo*). SABAH: Mostyn, 2 ♀♀, 20.viii.1969, *ex* *Apanteles* cocoon 'in' *Metisa plana* Walker (*Psychidae*), Beaufort, 1 ♀, 24.ix.1969, *ex* unidentified bagworm, Tuaran, 4 ♀♀, 22.xi.1969, *ex* bagworm on cocoa (*T. Sankaran*), CIBC. NEW GUINEA: Bubia, 4 ♀♀ (1 ♂), 10.x.1968 and 23.i.1969, *ex* *Borbo impar* Mabilie (*Hesperiidae*), P.A.T.I., 2 ♀♀, 29.vi.1971, 'ex pupa no. 15796', *per* Dept. Agric.; Bulolo, 9 ♀♀ (2 ♂♂), *ex* lepidopterous larva on *Hibiscus* sp., *per* Dept. Forests.

I first identified this species as *lividiscutum* (Gahan) after studying the paratype received on loan. I later questioned Dr B. D. Burks as to *elasmii* (Ashmead). After studying my provisional key and redescription he wrote on June 5th, 1970, as follows: 'I had a go at your Oriental *Pediobius* key. I think that *elasmii* and *lividiscutum* are the same. All the types of *elasmii* are males, and have the middle of the scutellum quite smooth, but we have a long reared series of this species that has all the females with the middle of the scutellum sculptured, the males in the series varying from sculptured to smooth. The males mostly also lack the beautiful colors of the females'.

On May 4th, 1971, he wrote as follows: 'Ashmead designated no holotypes; when he happened to name a species from only one specimen, it may be considered to be the holotype. Otherwise, lectotypes must be designated. So the types of *Asecodes elasmii* Ashmead are syntypes. I have marked one labelled "Manila, P.I.; W. A. Stanton Collector; *Asecodes elasmii* Ashm. ♂; Type No. 7916 USNM" as lectotype. Please designate it in your paper.' This I hereby do.

### *Pediobius agaristae* (Cameron)

*Cluthaira agaristae* Cameron, 1912 : 211-2. LECTOTYPE ♀, AUSTRALIA: N.S.W., Sydney (BMNH), here designated [examined].

*Pediobius agaristae* (Cameron) Bouček, 1965 : 7-8.

Head, seen from above, 2.0 to 2.3 times breadth of its median length. Frontovortex about four-fifths breadth of to slightly broader than its median length and about one and a half times the dorsal breadth of an eye, with ocelli in a very distinctly acute triangle; strongly

reticulate, though less so beside and behind the lateral ocelli, the reticulation mostly coarser in front of the median ocellus but very much finer and less strongly raised just above frontal fork. Sides of upper face rather strongly reticulate: lower face much more weakly, though very distinctly, reticulate except narrowly in mid line where, with the clypeus, it is almost smooth, the sculpture indistinct. Eyes strongly and densely hairy, in facial view relatively very strongly emarginate.

Antenna having scape hardly broadened to beyond middle, about five times length of its greatest breadth: funicle hardly broadened, 4-segmented, the first segment distinctly a little longer than broad, the following about quadrate or slightly transverse in side view and all very distinctly petiolate at apex: club composed of two regular segments, the second moderately smaller, plus a small terminal one (apiculus).

Sides of pronotal collar more or less strongly broadened to beyond middle, sharply narrowed behind: fore margin clearly indicated by a change of sculpture but not elevated. Notauli sharply impressed, running to rather narrowly triangular notaular pits that are sharply margined on inner side, are almost smooth and bear the main seta about in middle: mesoscutum having moderate, rounded reticulation in front merging to coarser, more transverse reticulation both between the notaular pits and on parapsides above, but having fine reticulation on sides of parapsides: hind margin between notaular pits scarcely emarginate. Scutellum strongly longitudinally striate at sides, merging to reticulate behind: the median band in about anterior half has the sculpture greatly weakening towards the front but is not shining and almost smooth. Propodeum having submedian carinae close, subparallel more than half way back then diverging at much less than  $45^\circ$ , and with no median carina: nucha rather strongly convex, distinctly sculptured: spiracles short-oval, the spiracular area, seen from above, produced into a blunt tooth above the hind coxa.

Petiolar segment a little longer than broad, finely reticulate, without longitudinal ridges above. First large tergite just over half length of gaster beyond petiole, almost smooth above, the sculpture before mid apex extremely weak, the following tergites very finely trans-striate to reticulate.

Hind tibial spur straight, reaching a little beyond apex of metatarsus.

Head above steel-blue with some bronzy reflection, sometimes blue-green in the reticulations before the ocelli, with upper face largely bronzy and lower face and clypeus blue or blue-green. Antennae blue-green. Sides of thorax and propodeum dull blue and bronzy: mesoscutum very dull blue or bronzy: scutellum blue-green anteriorly in middle, merging to bronzy at sides and behind: propodeum bright blue-green. Gaster very dull bronzy to brownish black, the first large tergite dark blue-green to greenish blue except for a mid apical patch. Legs dark blue-green, the tibiae generally a brighter green, more or less broadly pale at base and apex: tarsi dull stramineous, darkened towards apex.

No lectotype selection has previously been published. The type-material consists of two female specimens on each of two cards. One mount bears a red type label and was put in the type collection: Dr Z. Bouček examined this mount in 1964 and labelled it as bearing different species. The right-hand specimen does not agree with the original description: it is another, secondarily parasitic species which is described below (p. 180). I designate the left-hand specimen as lectotype. Both specimens on the other mount are *agaristae* (Cameron).

Redescribed from the following. AUSTRALIA: N.S.W., Sydney, 3 ♀♀, 28.ii.1903, 'parasite of *Agarista glycine*' (= *Phalaenoides glycinae* Lewin) (*W. W. Froggatt*) (lectotype and paralectotypes); N.S.W., Ryde, 2 ♀♀, 4.iii.1936, 'hyperparasites of *E. agaristae*', per Dept. Agric. (det. Ch. Ferrière). INDIA: Maharastra, Nagpur, 2 ♀♀ (1 ♂), 1950, ex *Ophioderes fullonia* (Clerck) (Phalaenidae), per E. S. Narayanan, IARI.

*Pediobius aspidomorphae* (Girault)

This is treated above (pp. 128-131) among the African species, but is, of course, included also in the key to the Asiatic and Australian species studied.

*Pediobius viridifrons* (Motschulsky)

*Cirrospilus viridifrons* Motschulsky, 1863 : 68. Unique holotype ♀, CEYLON: 'des sommets du mont Patannes' (Zoological Museum of the University, Moscow) [examined].

*Pediobius viridifrons* (Motschulsky) Bouček, 1965 : 553.

Head, seen from above, two and a half times breadth of its median length. Frontovortex nearly two and a half times the dorsal breadth of an eye and about one and a third times breadth of its median length, with ocelli in a right-angled triangle; in greatest part rather dull, with reticulation very distinct  $\times 45$ , mostly fine though wider-meshed beside the inter-ocellar area, but in about hinder half with broad orbital margins shining and bearing extremely fine reticulation. Sides of upper face finely reticulate. [Eye pilosity not clearly observable in unique type.]

Antenna having scape broadened to near apex, about four times length of its greatest breadth: funicle not broadened in side view, the segments about one and a half times length of their greatest breadth and club almost twice the length of one of them.

Pronotal collar having anterior margin distinct but weakly raised, bearing reticulation that is very fine but quite distinct  $\times 65$ , its sides distinctly broadened. Notauli very finely and sharply impressed, leading to notaular pits that are about triangular in shape, ill-defined but of moderate depth [what I take to be the seta base about two-fifths the way forward and very near the inner side]: reticulation on mesoscutum strongly outstanding and rather coarse, merging to moderately fine in the notaular pits: hind margin very weakly sinuate. Scutellum rather strongly convex, with reticulation strongly outstanding, strongly elongate in more than anterior half merging to almost rounded, very coarse above and at sides, merging to very much less so near mid line and behind. Propodeum having submedian carinae coalesced at base, whence they diverge rectilinearly and very gently to where they curve round before the nucha, which is broadly and rather weakly emarginate at apex: spiracles oval, not small, about their longer diameter from margin of metanotum, the spiracular area, seen from above, produced into a strong, sharp tooth above the hind coxa.

Petiolear segment, so far as can be observed in the unique type, much as described for *aspidomorphae* Girault (pp. 129-130). Gaster as described for *aspidomorphae* (pp. 129-130 and Text-figs 5-6), but the delicate sculpture on the bronzy part of the first large tergite distinct  $\times 45$  and more extensive than in that species, distinct to about half way forward.

[Hind tibial spur not clearly observed.]

Head dark blue-green to greenish blue, with weak bronzy reflections. Antennae similarly coloured. Dorsum of thorax, including pronotal collar, blackish with weak bronzy reflections, the mesopleura blue-green: propodeum medium green to blue. Gaster blackish, the first large tergite broadly blue-green to blue at sides. Legs, so far as can be observed, blue-green, the tarsi stramineous, with the apical segment pale brown.

Redescribed from the unique holotype.

This is obviously very closely related to *aspidomorphae* (Girault) and may later prove to be an aberrant form of that species. I do not, however, believe it to be so, for in a number of features it is outside the range of variation found in the several good series of reared specimens studied. The difference in appearance of the head from above is quite striking, even though measurements of the proportions may seem doubtfully convincing. I am grateful to Dr A. N. Zhelokhovtsev for sending the specimen on loan for study. Specimens of *aspidomorphae* are to be presented to the Zoological Museum of the University, Moscow.



***Pediobius carinatiscutum* (Girault) comb. n.**

*Pseudacrias carinatiscutum* Girault, 1917 : 1-2. LECTOTYPE ♀, JAVA: Salatiga (USNM, Washington), here designated [examined].

*Pseudacrias secundus* Girault 1917 : 7. LECTOTYPE ♀, JAVA: Salatiga (USNM, Washington), here designated [examined]. **Syn. n.**

*Pleurotropis carinatiscutum* (Girault) Gahan, 1932 : 750.

*Pleurotropis secundum* (Girault) Gahan, 1932 : 750 (*non* Gahan, 1951).

Head 2.0 to 2.2 times breadth of its median length. Frontoververtex little more than dorsal breadth of an eye, its least breadth less than its median length, with ocelli in a very acute triangle, the lateral separated by little more than their longer diameter; having a keel running around inner side of each lateral ocellus from occipital to orbital margin, but only a fine, incomplete median furrow running back from median ocellus; less shining than in *anomalus* (Gahan), though the sculpture very weak and indefinite. Sides of upper face finely transversely striate. Eyes weakly and sparsely hairy; in facial view extending very far below level of toruli, the genal margin almost transverse.

Antenna having scape quite four times length of its greatest breadth: flagellum relatively stouter than in *anomalus* (Gahan) and hardly broadened, the funicle segments much less obviously petiolate at apex, the first about one and a third, the third about one and a quarter, times length of their greatest breadth.

Pronotal collar relatively long as in *anomalus* (Gahan), but evenly emarginate behind. Notauli of the same form as in *anomalus* (Gahan) but more strongly and less sharply impressed laterally and not forming such a sharp margin medially: the smooth, quadrangular notaular pits bear the main seta about one-third the way forward and are separated by a keel that is stouter than in *anomalus* (Gahan) and that tapers from the front: anterior plate of mesoscutum bearing reticulation that is not arranged concentrically and in well-developed specimens is comparatively coarse, smooth along hinder periphery, the parapsides extremely finely striate to reticulate at sides, almost smooth nearer the notaular pits: hind margin hardly sinuate. Scutellum very distinctly longer than broad: in paratypes of *carinatiscutum* (Girault) having longitudinal striation at sides that converges behind, the more or less transverse connecting striae being very sparse and weak and the smooth median band almost percurrent; but in the paratype of *secundus* (Girault) examined the median band extends only about half way back and the striation merges to reticulation behind. Propodeum having submedian carinae closely juxtaposed or even coalesced in about basal half, then diverging at about 45°: nucha relatively longer than in *anomalus* (Gahan), strongly margined at sides and more strongly narrowed: spiracles elongate-oval, small, more than their longer diameter from margin of metanotum, the spiracular area, seen from above, produced into a rounded lobe above the hind coxa.

Petiolar segment not greatly broader at base than long; having a short pair of submedian longitudinal ridges above and a stronger, almost percurrent pair which form an angled separation of the sides from the upper surface, and with reticulation rather fine and regular. First large tergite less than half length of gaster beyond petiole in paratypes of *carinatiscutum* (though slightly more in paratype of *secundus*), the gaster more pointed than in *anomalus* (Gahan), the first large tergite virtually smooth ( $\times 100$ ), the following delicately reticulate to finely trans-striate, with smooth apical margins, more strongly hairy than in *anomalus* (Gahan).

Hind tibial spur almost straight.

Frontoververtex mostly red-violet, merging to bronzy before the ocelli, the lower and upper face dull green, the upper face more bronzy on the ridges of the reticulations. Antennae having scape pale testaceous, the pedicellus and flagellum blue-green to red-violet. Thorax and propodeum peacock-blue to, in greater part, red-violet, at sides dark blue-green and bronzy. Gaster dull bronzy to blackish, the first large tergite greenish blue near basal articulation merging to red-violet in more than basal half, and with narrow apical margin greenish blue. Legs blue-green with some red-violet infusion, the tibiae and tarsi mainly dull stramineous, the tibiae with some darkening above, the tarsi darkened only at extreme apex.

In paratype of *secundus* examined, upper face dull brown, antennae dull testaceous, with weak metallic colouring, thorax and propodeum dark blue-green to red-violet, first large tergite of gaster blue-green to red-violet in more than basal half.

Redescribed from the following. JAVA: Salatiga, 3 ♀♀ (on one card), 'From spider's egg-sac. Catalogue No. 20623', paralectotypes of *carinatiscutum* Girault; 1 ♀, 'From egg-case of spider, Salatiga. . . Catalogue No. 20633', paralectotype of *secundus* Girault. It seems possible that a cocoon mass of a Microgasterine Braconid could have been mistaken for a spider's egg-sac.

At my request, Dr B. D. Burks kindly checked the USNM material of *secundus* (Girault) and *anomalus* (Gahan) with my provisional key to the Asiatic species, females, and also of *carinatiscutum* (Girault) which I deduced might belong to the same complex. He found that Gahan (1951) appeared to have been mistaken in placing his *anomalus* as a synonym of *secundus*, and he arranged the loan of material of all three forms to me. Subsequently to my study of this material, I sent copies of my redescrptions of the species and revised key. He confirmed that my treatment accords with the type and other material in Washington.

As to the selection of lectotypes, Dr Burks writes regarding *carinatiscutum* 'There are 3 specimens mounted on the same card point. The one at the tip of the point should be designated lectotype. There are these labels for all the specimens "20623; Pseudacrias carinatiscutum Girault, ♀ types". I have added a lectotype label.' Regarding *secundus* he writes '*Pseudacrias secundus* Girault has 2 specimens on the same card point; the one at the tip of the point should be designated lectotype. The labels are "Pseudacrias secundus Gir. ♀ types; 20633." I added a lectotype label.' In accordance with his wish I hereby validate these designations.

***Pediobius anomalus* (Gahan) comb. n., sp. rev.**

(Pl. 5, fig. 10)

*Pleurotropis anomala* Gahan 1920 : 348-9. Holotype ♀, PHILIPPINES: Los Baños (USNM, Washington).

*Pleurotropis anomala* Gahan; Ferrière, 1933 : 96.

[*Pleurotropis secundus* (Girault); Gahan, 1951 : 170. Misidentification.]

[*Pediobius secundus* (Girault) Baltazar, 1966 : 116-7. Misidentification.]

Head, seen from above reniform, extremely little emarginate in front, 2.3 times breadth of its median length. Frontoververtex more than twice the dorsal breadth of an eye, with ocelli in a slightly acute triangle, the lateral separated by twice their longer diameter; having a fine median keel from the median ocellus and an even finer keel from the hinder corner of each lateral ocellus running back to the occipital carina; shining, with sculpture for the most part very inconspicuous even on inter-ocellar area, but some weak sculpture fans out from the median keel. Sides of upper face moderately transversely striate-reticulate, more regularly reticulate in lower corners. Eyes very weakly and sparsely hairy; in facial view extending well below level of toruli, the cheeks correspondingly strongly narrowed.

Antenna having scape about four times length of its greatest breadth; pedicellus comparatively slender and funicle very little broadened, the first segment about one and a half, the third about one and a third, times length of their greatest breadth in side view, the segments strongly petiolate at apex.

Pronotal collar relatively long, its hind margin more deeply emarginate in middle third, its sides moderately narrowed and very little rounded. Notauli starting back at about the normal angle, then becoming almost transverse and meeting before the notaular pits, very sharply impressed, the fore part of the mesoscutum before them distinctly raised above the hinder part: notaular pits smooth, quadrangular, bearing the main seta about half the way forward and about one-third the way sideways from the fine median keel that separates them: anterior plate of mesoscutum with fine striation that tends to be concentric around the mid point of its hinder margin, and parapsides with finer striation, much of it directed towards the scutellum: hind margin moderately sinuate. Scutellum very distinctly longer than broad, with longitudinal striation of moderate strength at sides which merges to reticulation behind, broadly in mid line shining, not quite smooth but with very weak reticulation. Propodeum having submedian carinae, as in most species, not closely juxtaposed at base, diverging very slightly at first but then at about  $45^\circ$ , and with no median carina: nucha broadly emarginate at apex: spiracles elongate-oval, comparatively large, not more than their longer diameter from margin of metanotum, the spiracular area seen from above produced into a blunt tooth above the hind coxa.

Petiole segment much broader than long, with irregular longitudinal ridges of moderate strength in front and with rather fine, irregular reticulation. First large tergite nearly two-thirds length of gaster beyond petiole, the gaster delicately reticulate on hinder part of the first large tergite (*i.e.* not the whole of the dark part), this reticulation clearly visible  $\times 45$ , and extremely delicately reticulate to trans-striate on those following.

Hind tibial spur straight, extending slightly beyond apex of metatarsus.

Head blue-green to blackish blue, sometimes red-violet before the ocelli (in paratype examined), the lower face dull green, the upper face the same in the meshes, dull brown on the ridges of the reticulations. Antennae blue-green, the flagellum more brown below. Thorax and propodeum bright greenish blue above, with slight brassy, bronzy and red-violet reflection: at sides dull blue-green and blue largely overspread with bronzy. Gaster dull bronzy to blackish, the first large tergite greenish blue above in about basal third. Legs blue-green, the mid and hind tibiae pale testaceous at apex: tarsi dull stramineous, the apical segment darkened.

Redescribed from the following. PHILIPPINES: Luzon, Los Baños, 1 ♀, i.iii.1918, *ex Endelus bakeri* Kerremans (Col., Buprestidae) (C. S. Banks) [USNM paratype no. 22345, mounted on its back, so that dorsum of thorax and abdomen are only visible very obliquely, but head and antennae are clearly visible all round]; Bataan, Lamao, 1 ♀ *ex larva* of *Promecotheca cummingii* Baly (Col., Hispidae) leaf-mining on cocoanut, *per* G. Merino, Bureau of Plant Industry [specimen lacks head but otherwise in good condition]. MALAYA: Johore, 4 ♀♀, iii.1963, *ex cocoon* of *Metisa plana* Walker (Lep., Psychidae) (B. J. Wood).

Additional material studied, a male from the last-mentioned series, and the following. PHILIPPINES: Luzon, Manila, 1 ♂, 13.x.1923, *ex larva* *Endelus* sp. (A. G. Toquero). JAVA: Tapos, Mt Gedeh, 800 m., 2 ♂♂, vi.1932, '*ex pupa* of Diptera ix in mines of Hispid in Amomum' (T. H. C. Taylor). MALAYA: Perak, 1 ♂, 28.v.1954, *ex Crematopsyche pendula* Joannis (I. J. Wyatt).

BIOLOGY. This species may be associated with leaf-mining Buprestidae and Hispidae, or may act as a parasite of the Psychidae *Metisa plana* Walker and *Crematopsyche pendula* Joannis, which feed on oil palms. In the latter case it may be highly gregarious, and there is no suggestion of its being a secondary parasite (see Wood, 1966 pp. 12, 15, 21-2, Sankaran, 1970 p. 52).



*Pediobius fraternus* (Motschulsky)

(Text-fig. 11)

*Eulophus fraternus* Motschulsky, 1859 : 118. Syntypes, sex not specified but evidently ♀, CEYLON: Colombo (Zoological Museum of the University, Moscow).

*Eulophus mantiechthrus* Motschulsky, 1859 : 117. Syntypes ♂, CEYLON: Colombo (Zoological Museum of the University, Moscow) [examined]. **Syn. n.**

*Eulophus fraternus* Motschulsky; Schmiedeknecht, 1909 : 415.

*Eulophus mantiechthrus* Motschulsky; Schmiedeknecht, 1909 : 416.

*Pleurotropis fraternus* (Motschulsky) Gahan, 1925 : 102, ♀.

*Pediobius mantiechthrus* (Motschulsky) Bouček, 1965b : 553.

*Pediobius fraternus* (Motschulsky) Baltazar, 1966 : 116.

Head, seen from above (Text-fig. 11), sub-globose, not sharply narrowed behind eyes, twice or just over the breadth of its median length. Frontoververtex longer medially than broad and 1.2 to nearly 1.5 times the dorsal breadth of an eye, with ocelli in a strongly acute triangle and relatively small; dull, finely and regularly reticulate, with the meshes more transverse before the frontal fork, beside and behind the lateral ocelli rather dull, the reticulation weaker but distinct. Sides of upper face rather finely reticulate, the meshes stretched downward; lower face and clypeus very finely but distinctly reticulate, rather dull. Eyes not distinctly hairy  $\times 100$ .

Antenna having scape five to six times length of its greatest breadth: funicle little broadened, having first segment about quadrate or slightly broader than long in side view, and second and third very distinctly transverse: club excluding terminal spine equal to combined length of second and third funicle segments.

Pronotal collar with fore and hind margins usually almost parallel, with sides very strongly narrowed, its anterior margin very distinctly raised, the reticulate microsculpture much more strongly outstanding on neck than behind it. Notauli varying from very distinct to hardly distinct anteriorly: notaular pits shallow, not bordered on inner or outer side, and bearing the main seta rather near the inner hind corner: mesoscutum rather finely reticulate on mid lobe, more finely so at sides and in notaular pits, weakly emarginate at apex. Scutellum weakly convex, decidedly broader than long, finely longitudinally striate-reticulate throughout. Propodeum having submedian carinae subparallel about half way back, then divergent at plainly less than  $45^\circ$ , and usually with no median carina: nucha very weakly developed, deeply emarginate: spiracles sub-circular to short-oval, the spiracular area, as seen from above, produced almost rectangularly above the hind coxa.

Petiolar segment broader than long, with anterior margin very strongly raised in middle, very finely reticulate and with longitudinal ridges that are of moderate strength and rather irregular but are percurrent or almost so. First large tergite about three-fifths length of gaster beyond petiole, almost smooth: following tergites duller, bearing comparatively strong hairs.

Hind tibial spur straight, reaching a little beyond apex of metatarsus.

Head above dark blue-green, almost entirely overspread with dull bronzy; before median ocellus and on upper and lower face a much brighter blue-green, with brassy and often coppery reflections. Antennae pale brown, often with weak metallic green reflections. Thorax above and at sides, and sides of propodeum blackish brown: scutellum towards apex or sometimes more extensively blue-green, the propodeum above blue-green often with bright bronzy reflection in median area or sometimes with more extensive red-violet reflection. Gaster very dull bronzy, blue-green to violet only at base of first large tergite. Legs mostly a rather bright blue-green, all tibiae pale at apex: tarsi stramineous, often only slightly darkened at apex.

Redescribed from the following. INDIA: Mysore, Bangalore, 2 ♀♀, viii.1970, *ex* Mantid ootheca, *per* CIBC. THAILAND: unlocalized, 3 ♀♀, 1965, '*ex* eggs of Mantid', *per* Dept. Agric. WEST MALAYSIA: Selangor, Kuala Lumpur, 3 ♀♀, 27.xii.1946,

'emerging from Mantid ootheca' (R. A. Lever). SUMATRA: E., Asahan, 50-60 m., 6 ♀♀, 1934-36, 'from Gambir-pests' (F. Schneider). HONG KONG: New Territories, Tai Lung, 2 ♀♀, 14.i.1966, 'ex eggs of praying mantis', per Agriculture and Fisheries Department. TAIWAN: Taihoku, 4 ♀♀, 'ex egg-mass *Paratenodera auridifolia*' (T. Shiraki) (including two Crawford homotypes).

Motschulsky (1859) wrote that he had received this species in numbers from Ceylon, and postulated the host as being Mantid eggs. The host-record cited by Gahan (1925) for the Philippine specimen seems doubtful.

Through the good offices of Dr B. D. Burks, I had on loan the material from Taiwan, including the two Crawford homotypes. Dr Burks told me it is not known that Crawford ever visited Moscow, but it is known that Kurdjumov visited Washington, and it is to be supposed that he had the syntypes of *fraternus* Motschulsky with him. Professor G. A. Viktorov very kindly brought the syntypes of *mantiechthrus* Motschulsky with him on a visit to England. These consist of seven specimens mounted on one card, all of them males. I have compared them with the series from Hong Kong, Thailand and Sumatra, including a male specimen from each country, and find them to be conspecific with *fraternus*. I do not wish to select any one specimen as lectotype.

Since the female is the better characterized sex and the name *fraternus* has come into use, I select this as the valid name for the species under the provisions of the International Code, Article 24 sections (a) and (b) (ii).

This is similar in appearance to but quite distinct from the African species reared from Mantid oothecae. The two may be distinguished as follows:

<p>Frontovertex decidedly narrowed from behind to near front (Text-fig. 11), with microsculpture finer and more regular: lateral ocelli plainly less than their longer diameter from orbital margin: reticulation on lower face and clypeus markedly more distinct: antennal funicle in side view little broadened: anterior margin of pronotal collar very distinctly raised, the reticulate microsculpture much more strongly outstanding on neck than behind it: scutellum slightly more convex, finely longitudinally striate-reticulate throughout, the transverse much weaker than the longitudinal ridges: petiolar segment having anterior margin very strongly raised in middle, and having longitudinal ridges more numerous and conspicuous . . .</p>	<p><i>fraternus</i> (Motschulsky)</p>
<p>Frontovertex roughly parallel-sided opposite inter-ocular area, with microsculpture markedly less fine and regular: lateral ocelli little less than their longer diameter from orbital margin: reticulation on lower face and clypeus markedly less distinct: antennal funicle in side view moderately broadened: anterior margin of pronotal collar very weakly raised and not delimiting a sharp difference of sculpture: scutellum markedly flatter, longitudinally reticulate medially, more striate-reticulate at sides: petiolar segment having anterior margin sharply raised throughout, as seen from above, but not strongly so in middle, and having longitudinal ridges less numerous and conspicuous</p>	<p><i>modestus</i> (Masi)</p>

### *Pediobius soror* sp. n.

(Text-fig. 12)

Head, seen from above, about two and a half times breadth of its median length. Frontovertex a little broader than its median length and over one and a half times the dorsal breadth of an eye, with ocelli in about a right-angled triangle and sometimes relatively large; having

fine keels running back from each ocellus and sideways from each lateral ocellus (Text-fig. 12); dull, finely and regularly reticulate, with the meshes more transverse before the frontal fork, smooth and shining beside and behind the lateral ocelli. Sides of upper face moderately reticulate. Eyes rather finely and sparsely hairy; in facial view extending well below level of toruli.

Antenna having scape elongate and narrow, about seven times length of its greatest breadth: funicle not broadened, the segments all about or nearly twice length of their greatest breadth in side view and distinctly petiolate at apex.

Pronotum having lateral angles prominent, as in *saulius* (Walker) (Bouček, 1965, pp. 11, 35-36) and in *coffeicola* (Ferrière), the collar with hind margin slightly more deeply emarginate in about middle third and consequently relatively short in mid-line, its sides moderately rounded and moderately to strongly narrowed. Notauli fine and sharply impressed, their sharp anterior margin continuing as an inner margin that runs about half way back the notaular pits; these bear deep, dull bronzy longitudinal impressions, are not bordered on outer side, and bear the main seta near the inner edge about half way forward, and are separated by a space about equal to the distance from their inner margin to the outer margin of the longitudinal impression. Mid lobe of mesoscutum with reticulation of moderate strength and rather regular, and parapsides more finely striate to reticulate: hind margin rather sharply emarginate in middle. Scutellum having longitudinal striations of moderate strength in greater part, merging to reticulation behind. Propodeum having submedian carinae close and more or less parallel in about basal half, often incurved or very slightly divergent, then diverging at much more than 45°, and with no median carina: nucha shining, well rounded at apex: spiracles elongate-oval, the spiracular area, seen from above, produced into a blunt tooth above the hind coxa.

Petiole much broader than long, with anterior margin strongly raised, with irregular longitudinal ridges which are not percurrent, and with reticulation fine to rather fine. First large tergite rather over half length of gaster beyond petiole, comparatively strongly reticulate on bronzy part, the following tergites much more delicately reticulate on the bronzy part.

Hind tibial spur curved, reaching well beyond apex of metatarsus.

Frontovertex mostly red-violet before the ocelli, dark blue-green and bronzy between and behind them: upper face very dark blue-green, the ridges of the reticulations dark and lower face and clypeus dark blue-green to blue. Antennae having scape and pedicellus strongly blue-green, and flagellum more weakly blue-green or pale brown with weak metallic reflections. Thorax and propodeum above blue-green, with blue and red-violet or occasionally bronzy reflections, at sides duller. Gaster comparatively bright bronzy, the first large tergite bright blue-green to red-violet in about basal two-thirds, this and the following tergites with apical margins smooth, sea-green. Legs in greater part dark blue-green, the tibiae usually a brighter green, the mid and hind tibiae often pale at apex: tarsi pale stramineous, the apical segment darkened.

Holotype ♀. BURMA: Insein, Kystpyngan Reserve, 27.ii.1939, ex *Pyrausta machaeralis* Walker (Pyraustidae) (*M. H. Desai*) per J. C. M. Gardner (BMNH).

Paratypes. BURMA: 1 ♀, same data as holotype. SUMATRA: E.C., Pematang Siantar, Mardjandi Estate, 2500', 6 ♀♀, 10.ii.1932, ex moth pupa on *Deguelia* sp. (*R. I. Nel*). Two males are present in the series from Burma.

### *Pediobius stenochoreus* sp. n.

Head broad, two and a quarter to two and a half times breadth of its median length. Frontovertex less than twice the dorsal breadth of an eye and not much more than its median length, with ocelli in about or less than a right-angled triangle, the lateral separated by about twice their longer diameter, having fine keels running sideways and back from lateral ocelli but a



mere indication of a furrow back from median ocellus; dull, finely and regularly reticulate in greater part, with the meshes more transverse before the frontal fork, but beside and behind the lateral ocelli shining, with reticulate sculpture very much weaker. Sides of upper face rather strongly transversely striate-reticulate above, more regularly reticulate below. Eyes rather finely and sparsely hairy, in facial view extending far below level of toruli.

Antenna having scape about four times length of its greatest breadth; flagellum slightly broadened in side view, the first segment nearly twice, the third about one and a third, times length of their greatest breadth, the segments very distinctly petiolate at apex.

Pronotal collar of normal relative length, its sides rather strongly narrowed. Notauli deeply impressed anteriorly, then running as very fine impressions to the outer anterior corners of the notaular pits; these sharply margined, straight-sided on outer and strongly curved on inner side, smooth, bearing the main seta rather nearer the hinder and inner sides, and separated by a space about one-third the width of either: mesoscutum moderately transversely striate-reticulate on mid lobe, more weakly longitudinally so on parapsides merging to reticulate at sides; hind margin gently curved behind the notaular pits, sharply emarginate between them. Scutellum longitudinally striate, merging to striate-reticulate behind, this sculpture much coarser than on mesoscutum, but narrowly in mid line in anterior half more finely sculptured. Propodeum having submedian carinae sub-parallel in about basal half and sometimes closely juxtaposed, then diverging at about  $45^\circ$ : nucha rather long, sharply margined at sides: spiracles elongate-oval, the spiracular area, seen from above, produced into a rounded lobe above the hind coxa.

Petiolear segment much broader than long, with anterior margin strongly raised into a tongue-like projection, finely to very finely reticulate, with a pair of strong longitudinal ridges at sides but without or only with traces of ridges above. Proportions of gaster beyond petiole varying, the first large tergite rather over half its length in the less elongate and pointed, much less than half in the more elongate and pointed specimens: first large tergite very delicately or occasionally comparatively strongly reticulate on the bronzy part, the following very finely reticulate to trans-striate, with smooth apical margins.

Hind tibial spur slightly curved, reaching well beyond apex of metatarsus.

Frontovertex dark blue-green, sometimes red-violet before the median ocellus: lower face dark blue-green, and upper face the same, but dull bronzy on the ridges of the reticulations or wholly dull bronzy. Antennae dark blue-green. Thorax and propodeum dark blue-green, sometimes with bronzy or slight red-violet reflections, at sides dark blue-green, largely over-spread with bronzy. Gaster brownish black, the first large tergite greenish blue in more than basal half, sometimes tinged with red-violet, the following tergites often with fine apical margins sea-green. Legs blue-green to dark blue, the tarsi stramineous, with the apical segment wholly or mostly fuscous.

Holotype ♀. PAKISTAN: Rawalpindi, Shawal, x.1970, *ex Lithocolletis* sp. (Gracilariidae), *per* CIBC (BMNH).

Paratypes. PAKISTAN: 2 ♀♀, same data as holotype; Khoongi, 1 ♀, 10.x.1963, *ex* cocoon probably *Apanteles* sp. on *Populus nigra*, *per* CIBC. INDIA: Uttar Pradesh, Dehra Dun, 1 ♀, 3.i.1929, parasitic on larva of *Nephopteryx rhodobasalis* Hampson (Phycitidae) (S. N. Chatterjee). A small male specimen, reared together with the female from Dehra Dun, has the reticulate sculpture on the frontovertex not distinct.

### *Pediobius painei* (Ferrière) **comb. n.**

*Pleurotropis painei* Ferrière, 1933 : 94-6. Holotype ♀, JAVA: Poerwardjo (BMNH) [examined]. *Pleurotropis painei* Ferrière; Taylor, 1937: 158-60.

Head, seen from above, two and a quarter times or less the breadth of its median length. Frontovertex relatively narrow, about as broad as its median length and about one and a half

times the dorsal breadth of an eye, with ocelli in a very decidedly acute triangle; shining, with reticulation for the most part indistinct  $\times 65$  though in and behind inter-ocellar area very fine but regular. Sides of upper face, in female only, shining, the sculpture indistinct or very weak. Eyes rather weakly and sparsely hairy, very distinctly so  $\times 45$ ; in facial view relatively strongly emarginate, extending very distinctly below level of toruli, the cheeks correspondingly strongly narrowed.

Antenna having scape narrow at base, very distinctly broadened to near apex, yet about six times length of its greatest breadth: funicle (Ferrière, 1933, fig. 5a) having all segments, in side view, ovate, distinctly longer than broad, shortly petiolate at apex, bearing hairs a little longer than the breadth of the segment that bears them.

Pronotum having lateral angles prominent, as in *saulius* (Walker) (Bouček, 1965, pp. 11, 35–36) and in *coffeicola* (Ferrière), the collar strongly contracted and rounded at sides behind its sharp anterior margin. Notauli not sharply impressed anteriorly or medially, running to smooth, almost quadrangular notaular pits of moderate depth, that are sharply margined anteriorly and bear the main seta about one-quarter the way back, the space between them a little narrower than a pit: sculpture of mesoscutum rather weak, consisting of reticulation that on mid lobe is rather wide-meshed but on parapsides is much narrower-meshed, merging to fine striation at sides: hind margin weakly sinuate. Scutellum weakly convex, having rather weak longitudinal striation at sides which merges to reticulation behind, and having indistinct reticulation on a broad median band that extends about two-thirds the way back. Propodeum having submedian carinae subparallel for more than half way back, then diverging at more than  $45^\circ$  and with no distinct median carina: nucha moderately convex: spiracles oval, the spiracular area produced into a small blunt ridge.

Petiolar segment stout, much broader than long, with a strong anterior flange that covers the apical part of the nucha, with longitudinal ridges weak and incomplete above but strong and complete at sides. First large tergite nearly two-thirds length of gaster beyond petiole: sculpture on dark part of first large tergite very weak and quite indefinite, and on those following extremely delicate.

Hind tibial spur straight, very nearly reaching ventral apex of metatarsus.

Head bright green to blue-green, sometimes with brassy reflection, dull bronzy on and behind inter-ocellar area, red-violet before the ocelli: upper and lower face bright green, with strong brassy to bronzy reflection. Antennae greenish blue. Thorax bronzy anteriorly, merging to blue-green and greenish blue: propodeum a brighter blue-green. First large tergite blue-green, with red-violet reflection in basal half or more, dull bronzy beyond: remainder of gaster dull bronzy, but the last visible tergite and ovipositor sheaths sometimes blue-green. Legs blue-green, or in part red-violet, the tibiae paler towards apex, and the tarsi dull stramineous, darkened towards apex.

Redescribed from the following. JAVA: Poerwardjo, 7 ♀♀ (including holotype and 5 paratypes), iii.1930, 'ex *Promecotheca* sp. internal parasite of pupa' (R. W. Paine). Three male paratypes are present in the series. Material recorded by Taylor (1937) as reared from other Hispid hosts has not been traced.

### *Pediobius* species, *imbreus* group

Like the African *afronigripes* group, these are related to the palaearctic species *pyrgo* Walker. *P. pyrgo* differs from all in having the head less narrowed behind eyes, the frontovertex with reticulation generally very distinct  $\times 45$  as in *afronigripes* nom. n. though somewhat finer, and the hind tibial spur extending very little beyond apex of the corresponding metatarsus. A further character additional to those given by Bouček (1965) for the separation of *waterstonii* (Masi) is the very

slender antennal scape: *pyrgo* has the eyes much more strongly hairy than in the remaining species, and the sculpture of the mesoscutum, though of the same general pattern, stronger than in any except the Australian species described below. *P. pyrgo* has the antennal flagellum markedly more strongly broadened in side view than in *imbreus* Walker and is not brightly coloured and shining like the parasite of *Erionota*.

***Pediobius erionotae* sp. n.**

(Text-fig. 10)

Head, seen from above, about two and a half to two and two-thirds times breadth of its median length, rather deeply emarginate behind (Text-fig. 10). Frontovertex about one and a third times breadth of its median length and twice the dorsal breadth of an eye, with ocelli in a very slightly acute triangle; shining, with reticulation irregular, for the most part indistinct  $\times 65$  though more distinct on inter-ocular area. Sides of upper face rather weakly reticulate. Eyes rather shortly and sparsely hairy, just distinctly so  $\times 25$ .

Antenna having scape narrow, six times length of its greatest breadth; funicle strongly broadened, the first segment up to twice as long as broad in side view (this proportion somewhat variable) and third a little broader than long, the segments distinctly petiolate at apex.

Sides of pronotal collar slightly rounded and slightly to moderately narrowed. Notauli sharp and fine, running to the rather shallow notaular pits, which are not margined on inner or outer side, and which bear stronger longitudinal impressions and the main seta just inward of those and rather more than a third the way forward; sculpture of mesoscutum much as described for *imbreus* Walker; hind margin moderately sinuate. Scutellum having a very broad percurrent median band almost smooth and very shining, with wide-meshed reticulate sculpture scarcely discernible  $\times 65$ , rather longitudinally striate-reticulate to either side of this. Propodeum having submedian carinae rather weakly and regularly diverging from base, curving very slightly outward, and with a fine but distinct median carina: nucha well developed, shining and rather strongly convex, very weakly emarginate at apex; spiracles oval, the spiracular area, seen from above, produced into a rather sharp tooth above the hind coxa.

Petiole segment broader than long, with anterior margin rather strongly raised, finely to very finely reticulate and with weak or rather weak and irregular longitudinal ridges which are not nearly percurrent. First large tergite rather over half length of gaster beyond petiole: reticulation on bronzy part of gaster extremely delicate, hardly distinct  $\times 65$ .

Hind tibial spur curved, extending well beyond apex of metatarsus. Head blue-green to blackish blue, with greater or lesser amount of red-violet and bronzy. Antennae blue-green. Thorax and propodeum above bright blue-green, blue and red-violet, at sides blue-green and bronzy, the pronotum before collar bronzy. Gaster bright pale bronzy, the first large tergite bright blue-green to red-violet in about basal two-thirds. Legs in greater part dark blue-green, often extensively tinged with blue to red-violet, the tibiae usually a brighter green: tarsi stramineous, the apical segment darkened.

Holotype ♀, WEST MALAYSIA: Negri Sembilan, Jelebu, 12.i.1938, ex ova of *Erionota thrax* L. (Hesperiidae), per Divn. Ent. Dept. Agric. (BMNH).

Paratypes. WEST MALAYSIA: Negri Sembilan, Jelebu, 5 ♀♀, same data as holotype; Pahang, Sungei Tua, 5 ♀♀, 31.vii.1928, ex ova *Erionota thrax* L. (G. H. Corbett). JAVA: Siloewok, Sawangan estate, 2 ♀♀, 18.viii.1938 (H. Duyvendijk). BORNEO: Sabah, Inanan, 2 ♀♀, 18.iv. and 19.viii.1970, ex ova of *Erionota thrax* L.; 5 ♀♀, 21.vii.1970, ex larvae of *Erionota thrax* L.; Tuanan, 1 ♀, 9.ii.1971, ex cocoon *Apanteles*



*erionotae* Wilkinson (Braconidae), 1 ♀, 22.iii.1971, 'ex unknown parasite pupa ex *E. thrax* larva', per CIBC.

**BIOLOGY.** Clearly this requires further investigation. That the species has been reared from either ova or larvae may be understood if it should have such biology as that described by Taylor (1937, pp. 161-2) for *Achrysocharis promecothecae* Ferrière, which attacks only eggs in which the development of the embryo is already well advanced, and thus may emerge from either egg-shell or young larva. That it should also have been reared from a cocoon of *Apanteles*, which is a larval parasite, is very unexpected.

### *Pediobius waterstonii* (Masi)

*Pleurotropis Waterstonii* Masi, 1929 : 231-6. Holotype ♀, LIBYA: Giarabub (MCSN, Genoa).

*Pediobius obtusiceps* Bouček, 1965 : 10-11, 47-8. Holotype ♀, CZECHOSLOVAKIA: Prague (Národní Museum, Prague).

*Pediobius waterstonii* (Masi) Bouček, 1970 : 95.

Since this species has been treated extensively by Masi (1929) and by Bouček (1965), only an abbreviated description is given here.

Head, seen from above, up to nearly three times breadth of its median length, rather weakly emarginate behind. Frontovertex with ocelli in a right-angled or obtuse triangle; in greater part shining, with reticulation not distinct (in *pyrgo* (Walker) generally almost as distinct as in *afronigripes* nom. n.). Sides of upper face weakly reticulate (in *pyrgo* with reticulation rather fine but rather strongly outstanding). Eyes rather weakly but moderately densely hairy, distinctly so  $\times 45$ .

Antenna having scape elongate and narrow, about eight times length of its greatest breadth (in *pyrgo* more rounded beneath, hardly five times): funicle moderately broadened in side view, the third segment about quadrate (in *pyrgo* strongly broadened, the third segment much broader than long).

Pronotal collar not, as stated by Masi, particularly short and without anterior margin, its sides moderately narrowed. Mesoscutum having reticulation much as in closely related species (see Bouček, 1965, fig. 33). Scutellum longitudinally striate, merging to longitudinally reticulate behind, having a narrow median band with the sculpture very much weaker. Propodeum having no median carina in the material cited below (cf. Bouček, 1965, fig. 33): nucha moderately convex and moderately emarginate at apex; spiracular area, seen from above, produced into a small tooth above the hind coxa.

First large tergite less than half length of gaster beyond petiole, very delicately reticulate in middle of about apical half, the following tergites extremely delicately reticulate to trans-striate.

Gaster dark bronzy to blackish, with very little green coloration at base of first large tergite. Legs steely green to brighter green, the tarsi whitish with the apical segment infusate.

**Material studied.** SAUDI ARABIA: Riyadh, 1 ♀, 29.iv.1970, 'ex gall moth', per U.N. Development Programme. PAKISTAN: Kabirwala, 2 ♀♀ (1 ♂), 29.ix.1971, ex *Pectinophora gossypiella* Saunders (Gelechiidae), per CIBC.

I am grateful to my colleague Dr Z. Bouček for confirming my placement of the specimen from Saudi Arabia and lending me a Spanish specimen for comparison.

*Pediobius pieridis* sp. n.

Head, seen from above, broad, about three times breadth of its median length, very weakly emarginate behind. Frontovortex over one and a half times breadth of its median length and over twice the breadth of an eye, with ocelli in a slightly to markedly obtuse triangle; dull, with reticulation fine to very fine and, except in middle of inter-ocellar area, rather indistinct, but beside and behind the lateral ocelli shining. Sides of upper face rather weakly and rather finely reticulate, the reticulation diagonally directed. Eyes rather sparsely hairy, distinctly so  $\times 25$ .

Antenna having scape nearly five times length of its greatest breadth: funicle strongly broadened in side view, the first segment little longer than broad, the third one and a third times as broad as long, the segments strongly petiolate at apex.

Pronotal collar relatively short, with some weak to moderate longitudinal striae, having sides little rounded and slightly to moderately narrowed. Mesoscutum not markedly narrowed at sides, but, behind the anterior angle, somewhat rounded or almost parallel-sided, the parapsides separated from the median lobe by deep impressions, the fine notauli running to rather shallow notaular pits which bear the main seta about one-third the way forward: sculpture much as described for *imbreus* Walker but stronger: hind margin rather strongly sinuate. Scutellum having longitudinal striation percurrent and rather strong, and a narrow median band with the sculpture much weaker to indistinct. Propodeum having submedian carinae diverging gently and regularly from base, and with no distinct median carina: nucha moderately convex and moderately emarginate at apex: spiracles small, oval, the spiracular area, seen from above, produced into a strong tooth above the hind coxa.

Petiolar segment somewhat broader at base than long, with anterior margin not strongly raised, finely or rather finely reticulate, and with short, weak longitudinal ridges not far behind anterior margin. First large tergite about half length of gaster beyond petiole, delicately reticulate on less than apical half, the following tergites extremely finely trans-striate before the finely reticulate apical hind margins.

Hind tibial spur curved, extending well beyond apex of corresponding metatarsus but not to mid point of second tarsal segment.

Head black to blue-black, the upper face with overspread of bronzy, the lower face, lower genae and clypeus very dark blue-green. Antennae blue-green. Coloration of thorax and propodeum much as described for *imbreus* Walker. Gaster blackish, without apparent green coloration. Leg colour as described for *imbreus* Walker.

Holotype ♀. AUSTRALIA: ACT, Canberra, 1 ♀, 23.ii.1950, *ex pupa* of *Pieris rapae* (L.) (F. Wilson) (ANIC, Canberra).

Paratypes. AUSTRALIA: 4 ♀♀, same data as holotype; Canberra, 1 ♀, 10.vii.1950, *ex cocoon* of *Plutella xylostella* (L.) (= *maculipennis* (Curtis)) (F. Wilson); N.S.W., Sydney, 1 ♀, 28.ii.1903, 'parasite of *Agarista glycine*' (= *Phalaenoides glycinae* Lewin) (W. W. Froggatt). Paratypes in BMNH and ANIC, Canberra.

Mr Frank Wilson informs me that he regarded this species, determined in 1951 as *Pleurotropis* sp., as a secondary parasite, probably through *Pteromalus puparum* L. in the case of those reared from *Pieris* and through *Thyraeella collaris* (Gravenhorst) in the case of that reared from a *Plutella* cocoon. The specimen reared by W. W. Froggatt is mounted on the same card as the lectotype of *P. agaristae* (Cameron) and is probably secondary through that species.

Two males are present in the series reared from *Pieris*: in facial aspect they are bright blue-green, with the reticulation on sides of upper face much finer and not diagonally directed.

*Pediوبيus imbreus* Walker

(Text-fig. 14)

*Eutedon* (*Pediوبيus*) *imbreus* Walker, 1846 : 184-5. Syntypes ♀, INDIA: Bombay (UM, Oxford) [examined].

*Pleurotropis detrimentosus* Gahan, 1930 : 9-10. Holotype ♀, INDIA: Tamil Nadu (= Madras), Palur (USNM, Washington).

*Pleurotropis detrimentosus* Gahan; Ferrière, 1933 : 94-6.

*Pleurotropis detrimentosus* Gahan; Taylor, 1937 : 163-4, 184.

*Pleurotropis detrimentosus* Gahan; Van der Vecht, 1950 : 59-61, fig. 19a, p. 60.

*Pediوبيus imbreus* Walker; Kerrich, 1970a : 89-90.

Head, seen from above, about two and a half times breadth of its median length, rather weakly emarginate behind. Frontovertex about one and a third or less the breadth of its median length and twice the dorsal breadth of an eye, with ocelli in a slightly acute triangle; shining, with reticulation irregular, generally for the most part indistinct  $\times 65$  though in inter-ocellar area distinct  $\times 45$ . Sides of upper face moderately reticulate. Eyes very weakly and sparsely hairy, just distinctly so  $\times 65$ .

Antenna having scape about four times length of its greatest breadth: funicle (Ferrière, 1933, fig. 5b) distinctly broadened in side view, the first segment one and a half times or more the length of its greatest breadth, the third distinctly broader than long, the segments distinctly petiolate at apex.

Sides of pronotal collar moderately narrowed. Notauli sharp and very fine, continuing as fine impressions in the shallow notaular pits, which are not margined in front or at sides, and bear the main seta about one-third the way forward: mesoscutum shaped as in Text-fig. 14, weakly sculptured, reticulate in middle of mid lobe, otherwise striate-reticulate, most strongly so beside the notaular pits, the sculpture just comfortably distinct  $\times 25$ , but much more strongly reticulate at sides of parapsides: hind margin moderately sinuate. Scutellum longitudinally striate at sides, merging to striate-reticulate behind the bristle, and having a usually broad median band, which is percurrent or almost so, generally shining, with sculpture absent or indistinct. Propodeum having submedian carinae diverging almost regularly from base at very much less than  $45^\circ$ , and with median carina usually very distinct: nucha rather strongly convex, narrowly but rather deeply emarginate at apex: spiracles short-oval, the spiracular area as seen from above produced into a prominent sharp tooth above the hind coxa.

Petiolear segment much broader than long, finely reticulate, usually having longitudinal ridges that mostly are percurrent, but are not strong or regular. First large tergite about half length of gaster beyond petiole, which is elongate-ovate, delicately reticulate on dark part of first large tergite, extremely delicately reticulate to trans-striate on those following.

Hind tibial spur strongly curved and long, almost reaching apex of second tarsal segment.

Normal coloration—frontovertex blackish or blue-black, with dark blue-green beside and behind lateral ocelli, often extending further forward: genae blackish, merging to dark blue-green on lower face and clypeus, the upper face bronzy. Antennae blue-green. Thorax above blackish, the pronotal collar bright blue-green, the propleura dark blue-green, the mesopleura dark blue-green above, bronzy below: propodeum bright blue-green above, darker below. Gaster dark bronzy to blackish, the first large tergite with blue-green coloration on about basal half or, more usually, less. Legs blue-green, or in part steely blue, the tarsi whitish, with the apical segment infuscate.

One specimen has the whole head and upper surface of the mesothorax a moderately bright blue-green: it was reared in Java by R. W. Paine in the same series as others with normal coloration.

Redescribed from the following. INDIA: Gujarat, Junagadh, 1 ♀, i.1968, 3 ♀♀, 1969, *ex larva* and *ex pupa* of *Nephantis serinopa* Meyrick (Xyloryctidae) on cocoa, *per* R. M. Patel; Mysore, Bangalore, ♀, xii.1969, *ex N. serinopa* (*N. B. Nayak*).



CEYLON: Batticaloa, 2 ♀♀, ix.1962, *ex* pupa of *Parasierola nephantidis* Muesebeck, E. Dharmaraju. WEST MALAYSIA: Prov. Wellesley, 8 ♀♀, 7.ii.1936, *ex* indet. lepidopterous larva (G. H. Corbett); Johore, Layang, 3 ♀♀, 1963, *ex* *Metisa plana* Walker, 2 ♀♀, iii.1963, *ex* *Crematopsyche pendula* Joannis (B. J. Wood). JAVA: Poerwardjo, numerous ♀♀, iii.1930, secondary parasite of *Promecotheca nuciferae* Maulik (Hispidae) (R. W. Paine) (see Taylor, 1937); Res. Kedu, numerous ♀♀, 1939, *ex* *Apanteles artonae* Rohwer on *Artona catoxantha* (Hampson) (Zygaenidae) (J. van der Vecht). Males are included in most of the series.

Walker's three female syntypes from INDIA: Bombay, were reared, presumably as secondary parasites, from *Epicephala chalybacta* Meyrick (Gracillariidae) (see Kerrich, 1970a). They have been compared with the above description.

Gahan (1930), describing the species from material reared as a secondary parasite of *Nephantis serinopa* Meyrick through *Parasierola* sp. (Bethyridae), described the scutellum as having a 'broader' percurrent smooth and polished median area, which is the normal condition in this species. Curiously, some specimens reared from the same primary host and submitted by Dr R. M. Patel have this median area narrower and duller, but I regard them as belonging to the same species. There is some variation in this character.

BIOLOGY (see especially Taylor, 1937; Van der Vecht, 1950). This species is commonly reared as a secondary parasite. Taylor, who handled a very large amount of living material, found it to be exclusively secondary except that occasionally it could act as a tertiary parasite through *Achrysocharis orientalis* (Ferrière). Wood (1966, p. 21), however, found that it appears occasionally to act as a primary parasite in association with Psychidae.

### *Pediobius parvulus* (Ferrière) **comb. n.**

(Text-fig. 15)

*Pleurotropis parvulus* Ferrière, 1933 : 94-6. Holotype ♀, JAVA: Poerwardjo (BMNH) [examined].  
*Pleurotropis parvulus* Ferrière; Taylor, 1937 : 160-1, 180-225.

This species is structurally very similar to *imbreus* Walker, but has been shown conclusively by Taylor (1937) to be biologically distinct.

Found to differ from *imbreus* Walker as follows: sides of upper face with reticulation weak and rather wide-meshed. Eyes quite distinctly hairy  $\times 65$ , *i.e.* rather more strongly hairy than in *imbreus*. Antenna having first funicle segment, in side view, hardly longer than broad. Sides of pronotal collar rounded, hardly narrowed, and sides of mesoscutum less sharply angled (Text-fig. 15): mesoscutum otherwise as described for *imbreus*, though the sculpture weaker. Scutellum very much as in *imbreus*, though the shining median band is less well marked, especially anteriorly, the lateral striation not stopping far short of the apex, as would be indicated from Ferrière's fig. 6c, though it may appear so if viewed from above with the light directed from in front. First large tergite well over half length of gaster beyond petiole, which is ovate, extremely weakly sculptured, relatively shorter than in

*imbreus* Walker so that the wings extend further beyond its apex. Very little green coloration on first large tergite.

This species is structurally very similar to *imbreus* Walker, and in order to ensure correct identification, the above diagnosis was made originally from the holotype and female paratypes only: male paratypes are included in the series. It appears to be the relative length of the gaster rather than the proportion of the wings in which it differs from *imbreus*.

Taylor (1937) recorded that the pupa of *parvulus* had a bluish sheen. He figured (p. 184) the ventral thoracic plates of the pupa of this species and of '*detrimentosus*', but I have been unable to correlate the difference adduced with the corresponding adult structures.

The following additional material has since been rechecked or determined. SINGAPORE: 2 ♀♀, 8.ix.1971, ex *Promecotheca* sp., gregarious pupal parasite, per D. H. Murphy, Dept. Zool. University; Sims Avenue, 1 ♀, 26.vi.1951 (*R. A. Lever*). NEW BRITAIN: Vunakanan, Gazelle Peninsula, 1 ♀, 16.v.1956, 'laying in mature larva *Promecotheca*' (*J. L. Gressitt*). FIJI: 1 ♀, viii.1971, ex *Promecotheca* sp., 2 ♀♀, 1971, ex *Agonoxena* sp. (*Agonoxenidae*), per CIBC.

A few specimens have been received from Ceylon, Peradiniya, from Dr H. E. Fernando, who wrote that the species had been introduced for the control of *Promecotheca cummingii* Baly. Dr D. Mariau has written that the species has been introduced to the Ivory Coast to assist in the control of *Coelaenomenodera elaidis* Maulik but that the introduction did not appear to be successful: however, in case it should later prove to have established, it is included in the African as well as the Asiatic key to species.

KEY TO THE FEMALES OF THE SOUTHERN ASIATIC AND AUSTRALIAN SPECIES STUDIED

- 1 Head well rounded and not strongly narrowed behind eyes (Text-fig. 9): occipital carina completely absent: propodeum having whole upper surface very finely reticulate, though the reticulation extremely weakly raised on anterior parts of lateral areas, the plicae laterales in almost hinder half produced into a strongly raised crest which overhangs the spiracular area, the circular spiracles almost as far from fore as from hind margin of propodeum: apical segment of all tarsi (Text-fig. 13) greatly swollen, about equal in length to that of the three preceding segments combined, that of the fore tarsus the most swollen *occipitalis* sp. n. (p. 156)
- Not as above: head much more, generally very strongly, narrowed behind eyes: occipital carina almost always sharp and complete above, extending well below upper level of eye, though in one species distinct only behind the lateral ocelli: propodeum having upper surface mainly smooth and shining between the plicae laterales, which are well developed but not produced into a strongly raised crest, the, usually oval, spiracles much nearer fore than hind margin of propodeum; apical tarsal segments not thus swollen . . . . . 2
- 2 Frontovortex with reticulation strong or moderately strong almost throughout and more or less regular . . . . . 3
- Frontovortex with reticulation not strong or moderately strong, but either fine and regular or in greater part weak to indistinct . . . . . 11
- 3 Sculpture of scutellum nearly uniform, either reticulate or striate almost throughout . . . . . 4
- Sculpture of scutellum not nearly uniform, partly striate or striate-reticulate and partly reticulate, often partly smooth . . . . . 9

- 4 Sculpture of scutellum in greatest part and of mesoscutum similar, reticulate almost throughout . . . . . 5
- Sculpture of scutellum longitudinally striate almost throughout, except in the next species (couplet 7) very dissimilar from that of mesoscutum . . . . . 7
- 5 Carinae from lateral ocelli to orbital margin well developed: scutellum having a shining hind margin projecting backward over a large part of the metascutellum: propodeum having submedian carinae quite distinctly divergent from base: gaster beyond petiole broad-oval, about one-fifth longer than its greatest breadth: hind tibial spur extending slightly beyond apex of the relatively short metatarsus, the tibiae not pale at apex . . . . . *inexpectatus* sp. n. (p. 157)
- Carinae from lateral ocelli to orbital margin not or not distinctly developed: scutellum regularly rounded behind and not covering a large part of the metascutellum: propodeum having submedian carinae subparallel about half way back then diverging at about 45° (Waterston, 1915, fig. 13): gaster beyond petiole of more usual proportion, about one-half longer than its greatest breadth or more: hind tibial spur short and almost straight, not reaching far beyond mid length of corresponding metatarsus, the mid and hind tibiae pale at apex . . . . . 6
- 6 Larger species, of length over 2 mm: petiolar segment strongly transverse, about twice as broad as long: antennal scape elongate and narrow for the genus, about seven times length of its greatest breadth, and almost reaching the median ocellus. Iran . . . . . *illustris* (Waterston) (p. 158)
- Smaller species, of length about 1½ mm: petiolar segment a little longer than broad: antennal scape of more normal proportions, about four times length of its greatest breadth, not nearly reaching the median ocellus. Europe to southerly India . . . . . *acantha* (Walker) (p. 159)
- 7 Wing fringe exceptionally long for the genus, the cilia at anal angle about a quarter, the seta at junction of marginal and radial veins a third, the greatest breadth of fore wing: setae exceptionally long and strong for the genus, the largest head seta, which arises just before the occipital margin, nearly the length of an eye, seen from above, the scutellar seta well over half the length of fore wing: sculpture of mesoscutum and scutellum in greatest part similar, coarsely longitudinally striate almost throughout, though that on scutellum merging to reticulate near apex: antennal scape and tibiae blue-green. New Hebrides . . . . . *longisetosus* sp. n. (p. 160)
- Wing fringe very much shorter than as above, normal for the genus or shorter: setae not so very long and strong (as e.g. in Plate figures and Text-figs 10-15): sculpture of mesoscutum and scutellum dissimilar: antennal scape and tibiae stramineous, with no more than slight darkening near base of hind tibia . . . . . 8
- 8 Lower face and clypeus smooth: antennal funicle in side view having first segment about one and a half times length of its greatest breadth and third about quadrate: sides of pronotal collar very little narrowed: gaster beyond petiole moderately elongate and markedly pointed towards apex, the first large tergite a little less than half its length . . . . . *ptychomyiae* (Ferrière) (p. 161)
- Lower face and clypeus very finely but distinctly reticulate: antennal funicle in side view having first segment a little longer than broad and third much broader than long: sides of pronotal collar strongly narrowed: gaster beyond petiole very broad-oval, rounded at apex except for the protruding ovipositor sheaths, the first large tergite almost two-thirds its length . . . . . *bethylicidus* sp. n. (p. 162)
- 9 Head, seen from above, relatively broad, 2½ to 3 times breadth of its median length and frontovertex usually about 1½ times: first funicle segment, in side view, in well-developed specimens, about 2½ times as long as broad: scutellum longitudinally striate-reticulate, merging to regular reticulation in about apical third, the sculpture of almost uniform strength except that, narrowly in mid



line in basal part, it is finer yet very distinct: space between notaular pits very much narrower than a pit (Pl. 4, fig. 1)

*foveolatus* (Crawford) (= *epilachnae* (Rohwer)) (p. 163)

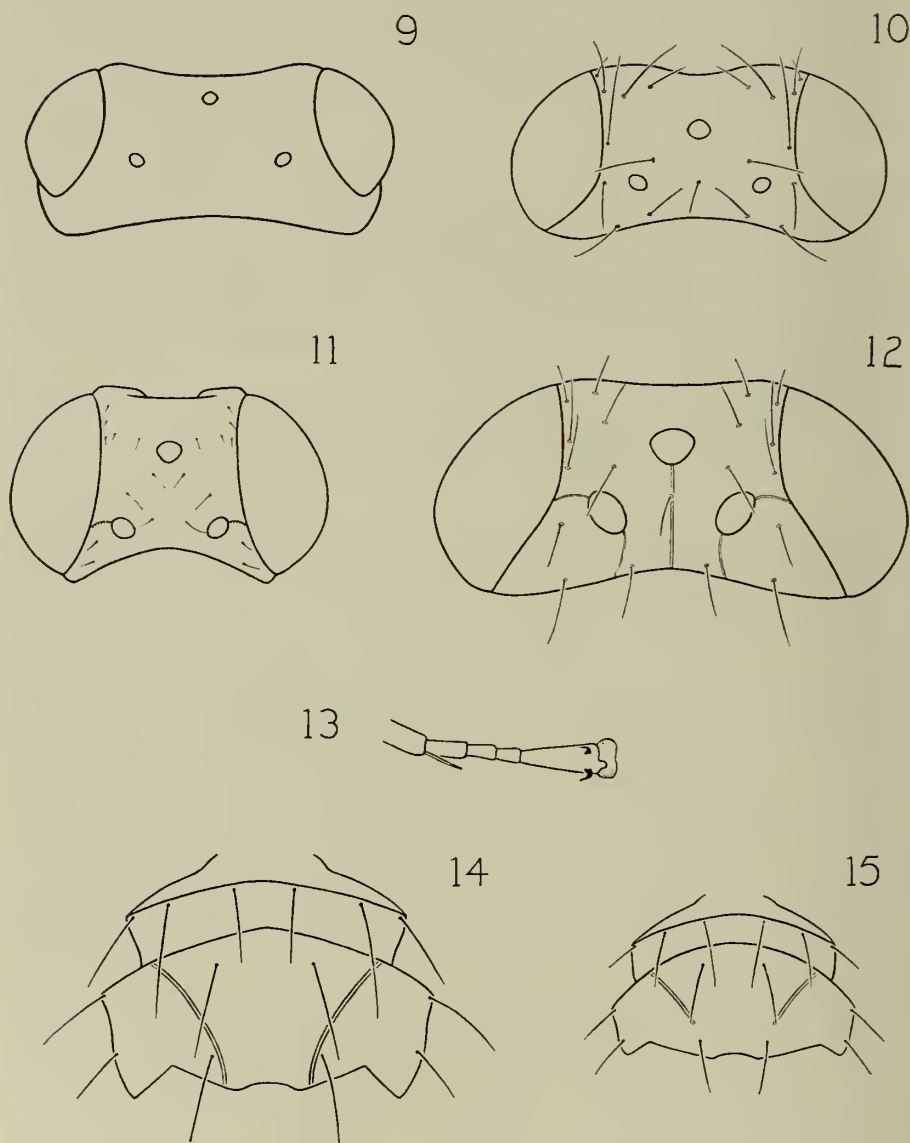
- Head not so broad, less than  $2\frac{1}{2}$  times breadth of its median length and frontovertex less than  $1\frac{1}{2}$  times: first funicle segment, in side view, about  $1\frac{1}{2}$  times as long as broad: scutellum strongly longitudinally striate at sides almost to apex, with reticulation at apex that is rather wide-meshed but much weaker, and may extend forward broadly in mid line or may be evanescent, leaving a shining median band in about basal two-thirds: space between notaular pits about as broad as a pit . . . . . 10
- 10 Antennal funicle 3-segmented and pronotal collar sharply margined as is normal for the genus: mesoscutum having longitudinal striation on sides of mid lobe and on parapsides, its hind margin between the notaular pits raised and strongly emarginate: petiolar segment much broader than long: lower face, as normally in the genus, almost smooth: tibiae not or hardly pale at base and apex. India and Ceylon to New Guinea . . . *elasmi* (Ashmead) (= *lividiscutum* (Gahan)) (p. 166)
- Antennal funicle 4-segmented: the smooth pronotal collar clearly indicated by a change of sculpture but with no elevated margin: mesoscutum without longitudinal striation, its hind margin between the notaular pits very weakly emarginate: petiolar segment a little longer than broad: lower face very distinctly reticulate except narrowly in mid line: tibiae very distinctly pale at base and apex. Australia, India . . . . . *agaristae* (Cameron) (p. 167)
- 11 Scutellum rather strongly convex: sculpture of mesoscutum and of scutellum rather similar, consisting of reticulation that is relatively strongly outstanding, that is in large part coarse and tends to be longitudinal (Pl. 5, fig. 1): female gaster (Text-figs 5-6) not, as in most species, gradually more or less pointed but of masculine form, relatively broad and, apart from the ovipositor sheaths, very broadly rounded at apex, having the first large tergite relatively large, and the epipleura almost or quite meeting midventrally for a considerable length . . . 12
- Scutellum of normal convexity for the genus or flatter: sculpture of mesoscutum and of scutellum dissimilar, no more than moderately outstanding and patterned otherwise: female gaster not as in alternate but of normal feminine form, gradually more or less pointed to apex . . . . . 13
- 12 Head, seen from above, very broad,  $2\frac{3}{4}$  times breadth of its median length: notaular pits rather well-defined, sub-triangular: propodeum having submedian carinae not coalesced at base and diverging less gently: first large tergite with sculpture not or not very distinct and not extensive . . . *aspidomorphae* (Girault) (p. 128)
- Head, seen from above, less broad,  $2\frac{1}{2}$  times breadth of its median length; notaular pits ill-defined but of moderate depth: propodeum having submedian carinae coalesced at base, diverging rectilinearly and very gently to before the nucha: first large tergite with sculpture distinct  $\times 45$  and more extensive than in alternate, distinct to about half way forward . . . *viridifrons* (Motschulsky) (p. 169)
- 13 Notauli almost transverse, meeting before the notaular pits, the fore part of the mesoscutum before them distinctly raised above the hinder part: notaular pits smooth, quadrangular, separated only by a median keel (Pl. 5, fig. 2) . . . 14
- Notauli running normally for the genus, not meeting medially nor causing such discontinuity of level across the mesoscutum: notaular pits separated by an area usually of breadth at least comparable to that of one of them, though in one species about one-third the width of either but very decidedly more than just a keel . . . . . 15
- 14 Head, seen from above, less broad, 2.0 to 2.2 times breadth of its median length; with ocelli in a very acute triangle, the lateral separated by little more than their longer diameter; with a fine, incomplete median furrow running back from the median ocellus: eyes extending very far below toruli, the genal margin almost

transverse: fore part of mesoscutum comparatively coarsely reticulate, and notaular pits separated by a rather strong median keel that tapers from the front: propodeum having submedian carinae closely juxtaposed or coalesced in about basal half: first large tergite virtually smooth: cubital hair-row starting immediately beyond basalis: tibiae mainly dull stramineous, with some darkening above

- carinatiscutum** (Girault) (p. 170)
- Head, seen from above, broader, 2.3 times breadth of its median length, with ocelli in a slightly acute triangle, the lateral separated by twice their longer diameter; with a fine median keel running from the median ocellus right back to the occipital carina: eyes extending less far below toruli, the genal margin not almost transverse: fore part of mesoscutum with comparatively fine, concentrically arranged striation, and notaular pits separated by a fine median keel: propodeum having submedian carinae not juxtaposed basally (Pl. 5. fig. 10): first large tergite having reticulation clearly visible  $\times 45$  on hinder part: cubital hair-row starting well beyond the large speculum postbasale: tibiae metallic blue-green, the mid and hind pale at apex
- anomalus** (Gahan) (p. 171)
- 15 Frontovortex, at least in greater part, with reticulation fine and regular: pronotal collar having sides strongly or rather strongly narrowed: scutellum having sculpture more or less uniform, very distinct throughout: basalis bare, and cubital hair-row starting beyond the speculum postbasale 16
- Frontovortex in greater part with reticulation weak and irregular to indistinct: pronotal collar having sides no more than moderately narrowed except in *painei* (Ferrière), see couplet 16 below: scutellum having a median band, percurrent or almost so, with sculpture more or less indistinct, sometimes this median band broad and shining: except in *painei* (Ferrière), basalis bearing hairs and cubital hair-row starting immediately beyond it 18
- 16 Smaller species, of length about 1.3 mm: head, seen from above (Text-fig. 11) subglobose, not sharply narrowed behind eyes, with ocelli in a strongly acute triangle, and no fine keel running back from the lateral ocelli, the frontovortex not as broad as its median length: antennae having first funicle segment in side view about quadrate, the second and third very distinctly transverse: pronotal collar having fore and hind margins parallel: mesoscutum having hind margin weakly emarginate, the notaular pits shallow and ill-defined: scutellum finely longitudinally reticulate throughout: parasite in Mantid oothecae
- fraternus** (Motschulsky) (p. 173)
- Larger species: head, seen from above, more transverse, sharply narrowed behind eyes, with ocelli in about a right-angled or slightly acute triangle, and a fine keel running back from the lateral ocelli, the frontovortex at least slightly broader than its median length: antennae having first funicle segment in side view about twice as long as broad, the second and third distinctly longer than broad: pronotal collar wider at sides than in middle, the fore and hind margins not parallel: scutellum strongly longitudinally striate, merging to reticulate behind 17
- 17 Head having a distinct, fine median keel running from the median ocellus right back to the occipital carina (Text-fig. 12): antennal scape about 7 times length of its greatest breadth: pronotal collar more deeply emarginate in middle third: mesoscutum having reticulation rather regular on mid lobe, the notaular pits separated by a space about equal to the distance from their inner margin to the outer margin of their bronzy longitudinal impression. Burma, Sumatra **soror** sp. n. (p. 174)
- Head having a mere indication of a furrow running part way back from the median ocellus: antennal scape about 4 times length of its greatest breadth: pronotal collar evenly emarginate behind: mesoscutum striate-reticulate on mid lobe, the notaular pits separated by a space about one-third the width of either. Pakistan, India **stenochoreus** sp. n. (p. 175)

- 18 Frontovertex relatively narrow, about  $1\frac{1}{2}$  times the dorsal breadth of an eye, with ocelli in a very decidedly acute triangle: eyes, in facial view, extending very distinctly below level of toruli and cheeks correspondingly strongly narrowed: pronotal collar strongly contracted and rounded at sides: notaular pits rather clear-cut, of moderate depth, almost quadrangular, smooth, bearing the main seta about one-quarter the way back from the front: propodeum having submedian carinae subparallel for more than half way back, then diverging at more than  $45^\circ$   
*painei* (Ferrière) (p. 176)
- Frontovertex relatively broad, about twice the dorsal breadth of an eye, with ocelli in a very slightly acute triangle: eyes, in facial view, extending hardly below level of toruli and cheeks correspondingly narrowed normally for the genus: pronotal collar with sides no more than moderately narrowed: notaular pits ill-defined, shallow, rounded, sculptured much as the rest of the mesoscutum, and bearing the main seta about one-third the way from the back: propodeum having submedian carinae diverging from base at much less than  $45^\circ$ . (*imbreus* group) 19
- 19 Shining and brightly coloured: head moderately emarginate behind (Text-fig. 10): median band of scutellum broad: nucha of propodeum very weakly emarginate at apex: first large tergite brightly coloured in about basal two-thirds. West Malaysia, Java, Borneo, associated with *Erionota thrax* (Hesperiidae)  
*erionota* sp. n. (p. 178)
- Dull and mostly dull coloured: head more or less shallowly emarginate behind: median band of scutellum of moderate breadth to narrow: nucha of propodeum moderately to rather deeply emarginate at apex: first large tergite seldom brightly coloured in more than basal half, usually in much less . . . . . 20
- 20 Occipital carina discontinuous, represented only by a short ridge developed behind each lateral ocellus: antennal scape very slender, almost parallel-sided for the greater part of its length, about eight times length of its greatest breadth: third funicle segment about quadrate. Europe south of the Carpathians, Saudi Arabia, Pakistan . . . . . *waterstonii* (Masi) (= *obtusiceps* Bouček) (p. 179)
- Occipital carina continuous, as is normal in the genus: antennal scape slightly rounded below, no more than about five times length of its greatest breadth: third funicle segment distinctly broader than long . . . . . 21
- 21 Head, seen from above, about three times breadth of its median length, very weakly emarginate behind, with ocelli in a slightly to moderately obtuse triangle: eyes distinctly hairy  $\times 25$ : scutellum having median band narrow: nucha moderately emarginate at apex: hind tibial spur not reaching mid point of second tarsal segment. Australia . . . . . *pieridis* sp. n. (p. 180)
- Head, seen from above, about two and a half times breadth of its median length, rather weakly emarginate behind, with ocelli in a very slightly acute triangle: eyes distinctly hairy  $\times 65$ : scutellum generally having median band moderately broad: nucha rather deeply emarginate at apex: hind tibial spur extending well beyond mid point of second tarsal segment. S.E. Asia . . . . . 22
- 22 Sides of upper face moderately reticulate: sides of pronotal collar more contracted and mesoscutum more angulate (Text-fig. 14): antenna having first funicle segment very distinctly longer than broad (Ferrière, 1933, fig. 5b): gaster beyond petiole elongate-ovate, the fore wings not extending far beyond its apex  
*imbreus* Walker (= *detrimmentosus* Gahan) (p. 181)
- Sides of upper face with reticulation weak and rather wide-meshed: sides of pronotal collar less contracted and of mesoscutum less angulate (Text-fig. 15): antenna having first funicle segment hardly longer than broad (Ferrière, 1933, fig. 5c): gaster beyond petiole ovate, i.e. relatively short, the fore wings extending further beyond its apex . . . . . *parvulus* (Ferrière) (p. 182)





FIGS 9-12. Head, seen from above, of 9, *P. occipitalis* sp. n., 10, *P. erionotae* sp. n., 11, *P. fraternus* (Motschulsky) and 12, *P. soror* sp. n.

FIG. 13. *P. occipitalis* sp. n., left hind tarsus, plantar aspect.

FIGS 14-15. Pronotum and mesoscutum of 14, *P. imbreus* Walker and 15, *P. parvulus* (Ferrière).

## ASIATIC SPECIES NOT STUDIED

***Pediobius thoracicus* (Zehntner) comb. n.**

*Pleurotropis thoracica* Zehntner, 1898 : 11-12, figs 14-18.

This species was described from Java, reared as a secondary parasite of *Cosmopteryx pallifasciella* Snellen (Cosmopterygidae) leaf-mining in sugar. According to information kindly supplied by Professor J. van der Vecht, the original material is almost certainly lost. The description and figures, based on the male sex only, suffice to place the species undoubtedly in *Pediobius* Walker. I do not find them good enough to place it in my key to the Asiatic species, but think they will be found sufficient to recognize the species with confidence when it has again been reared from the same primary host. I have requested that such rearings be made.

***Pediobius ellia* (Motschulsky) comb. n.**

*Tetrastichus Ellia* Motschulsky, 1863 : 69. LECTOTYPE ♂, CEYLON: 'des Montagnes de Nura-Ellia' (Zoological Museum of the University, Moscow), here designated [examined].

The material standing as this species is as follows: a mount on which are affixed a male *Pediobius* and an undetermined Pteromalid, bearing labels 'type' and 'Tetrastichus Ellia Motsch T. or. Ceyl. Mt. N.E.', and a second mount on which is affixed a female *Pediobius*, bearing a label 'Tetrastichus Ellia Motsch.' in manuscript and 'coll. Motschulskovo' in print. The first mount bears the further label 'Pediobius ellia (Motsch.) ♂ Zd. Bouček det. 1968'. Dr Bouček has not published any note following his examination of the material that year. Dr A. N. Zhelokhovtsev has kindly sent me the material on loan for study.

Dr Bouček and I are agreed that, for selection of lectotype, the Pteromalid can definitely be excluded. We are further agreed that, of the two *Pediobius*, the male fits the original description better in a number of points and should be designated as lectotype; in particular, the second large tergite is broader than the first in this specimen, and the extrusion of the genitalia presumably led the author to describe the abdomen as apically mucronate. The species belongs to the *imbreus* group. The frontovertex is bright blue-green and the mesoscutum brassy green, whereas in males of the other species of this group here treated, these parts are considerably darker.

The female specimen is also a species of the *imbreus* group: in my key to species it fits *pieridis* sp. n. much better than *imbreus*. It differs from *pieridis* most clearly as follows: first funicle segment about twice as long as broad, the third very distinctly longer than broad: pronotal collar not short: mesoscutum having sculpture weaker and hind margin hardly sinuate: scutellum having longitudinal striation much weaker: petiolar segment having longitudinal ridges rather strong and extending more than half way back: first large tergite blue-green in about basal half.

## NEOTROPICAL SPECIES

*Pediobius irregularis* sp. n.

Head, seen from above, about twice breadth of its median length. Frontovortex having breadth about or less than its median length and one and a half times to twice the dorsal breadth of an eye, with ocelli in a strongly acute triangle, the lateral less than their longer diameter from orbital margin. Reticulation beside and behind lateral ocelli fine to very fine and weak, before this rather fine to moderately coarse and moderately outstanding, on triangle above frontal fork rather transverse, on upper face, lower face, clypeus and genae fine to very fine. Eyes extending below level of toruli, having pilosity very short and fine ( $\times 100$ ). Clypeus rather broad, its apical margin reflexed: mandibles elongate, but with teeth of normal length.

Antenna having scape about four times and pedicellus twice length of its greatest breadth: funicle slightly broadened in side view, the first segment about one and a half times length of its greatest breadth and third about quadrate or slightly broader than long, and club excluding terminal spine shorter than combined length of last two funicle segments.

Pronotal collar having sides moderately rounded. Notauli weakly but sharply impressed, leading to triangular notaular pits, which are rather shallow but very distinct and which bear the main seta about in or slightly forward of middle: mesoscutum having reticulation irregular, moderate to rather coarse on mid lobe, markedly less outstanding than on main part of frontovortex, on sides of parapsides weaker and finer and in the notaular pits much finer: hind margin broadly and weakly sinuate. Scutellum of triangular appearance, weakly convex, except near anterior margin coarsely, weakly and irregularly longitudinally striate to striate-reticulate, tending to be smooth near apex. Propodeum strongly raised to middle, having submedian carinae close together for their whole length, only slightly divergent from near base, often subparallel in about hinder half, and generally with an indication of a median carina: nucha short, markedly convex, deeply emarginate at apex: spiracles elongate-oval, hardly their longer diameter from margin of metanotum, the spiracular area, seen from above, produced into a weak rounded lobe above the hind coxa.

Petiolear segment almost one and a half times length of its basal breadth, rather finely elongate-reticulate, with anterior margin rather strongly raised. Remainder of gaster short-ovate, the first large tergite about half its length or little more, smooth, the following finely reticulate.

Hind tibial spur almost straight, reaching well beyond apex of metatarsus.

Frontovortex bright green through peacock-blue to red-violet: face and cheeks generally dull green to purplish-bronzy though occasionally brighter. Antennae having flagellum a more or less bright green: in most specimens scape and pedicellus stramineous to pale testaceous, the pedicellus with slight metallic darkening above, but in one these are metallic green also, so the other specimens may be slightly teneral. Dorsum of thorax and propodeum medium to dark green and red-violet: sides a duller green and bronzy. Gaster bronzy, the first large tergite medium green to red-violet except in middle of about apical quarter or sometimes much less. Coxae, hind trochanters and femora green to red-violet: tibiae and fore and mid femora very pale testaceous, with greater or lesser amount of metallic darkening, sometimes almost wholly darkened: tarsi stramineous, usually darkened only at extreme apex.

Holotype ♀. BRITISH HONDURAS: Melinda Road, 30.iii.1967, *ex* egg mass of *Exophthalmus vitticollis* Champion (Curculionidae) on citrus (*L. W. van Whervin*) (BMNH).

Paratypes. BRITISH HONDURAS: 11 ♀♀, same data as holotype but 21.iii.-10.iv.1967. Four males are present in the series.

Unlike any other species known to me, particularly in the form of the scutellum, which is of triangular appearance, weakly convex and having the sculpture mostly coarse but weakly raised. The propodeum is unusually strongly raised in middle.



Among African and Asiatic species it would run best with the parasites in Mantid oothecae, namely *modestus* (Masi) and *fraternus* (Motschulsky) respectively. It resembles these in the head shape, the comparatively short antennae and the weakly convex scutellum; but they differ from it markedly in having the sculpture of the mesoscutum and scutellum much finer and more regular, the scutellum not of triangular form but very broadly rounded behind, and the propodeum not markedly raised in middle.

In running this species in the keys of Bouček (1965) and Burks (1966) difficulty immediately arises in that the femora are mostly metallic but the tibiae pale. Ignoring that dichotomy, it is found to agree best with species secondarily parasitic in egg-sacs of spiders, namely *brachycerus* (Thomson) and *wilderi* (Howard) respectively. These two species are very similar, and merit comparison. They resemble *irregularis* sp. n. in having the propodeum rather strongly raised in middle, but differ in having the sculpture of the mesoscutum and scutellum much finer, the scutellum rather strongly convex, and the head, notably the frontovertex, broad, with the ocelli in a decidedly obtuse triangle.

The only other species known to me to be recorded from the neotropical region is *olethreutidis* (Gahan, 1932) from Cuba. Dr Burks confirms that this is closely related to *sexdentatus* (Girault) and would run with that in his key to the North American species.

#### A VENATIONAL CHARACTER

Basalis bearing hairs, normally two, and cubital hair-row starting immediately beyond it (as in *P. glabratus* Bouček (Bouček, 1965, fig. 60)).

*ropalidiae* (Risbec), *rhyssonotus* sp. n., *taylori* sp. n., *angustifrons* sp. n., *neavei* (Waterston), *acraconae* sp. n., *aspidomorphae* (Girault), *marjoriae* sp. n., *clino-gnathus* (Waterston), *arcuatus* sp. n., *homoeus* (Waterston), *praeveniens* sp. n., *hirtellus* (Masi), *furvum* (Gahan), *vignae* (Risbec), *afronigripes* nom. n., *viginti-quinque* Kerrich, *amaurocoelus* (Waterston), *dipterae* (Risbec), *occipitalis* sp. n., *inexpectatus* sp. n., *illustris* (Waterston), *acantha* (Walker), *longisetosus* sp. n., *ptychomyiae* (Ferrière), *bethylicidus* sp. n., *foveolatus* (Crawford), *elasmi* (Ashmead), *agaristae* (Cameron), *viridifrons* (Motschulsky), *carinatiscutum* (Girault), *erionotae* sp. n., *waterstonii* (Masi), *pieridis* sp. n., *imbreus* Walker, *parvulus* (Ferrière), *irregularis* sp. n.

Basalis bare, and cubital hair-row starting beyond the large speculum postbasale (as in *saulius* (Walker) (Bouček, 1965, fig. 24)).

*setigerus* Kerrich, *coffeicola* (Ferrière), *anastati* (Crawford), *modestus* (Masi), *telenomi* (Crawford), *anomalus* (Gahan), *fraternus* (Motschulsky), *soror* sp. n., *stenochoreus* sp. n., *painei* (Ferrière).

The condition in *africanus* (Waterston) is described under that species (p. 144 above).

## HOST-PARASITE LIST

List of hosts and parasites of them mentioned in this work.

Host	Parasite
ORTHOPTERA: MANTODEA	
Egg-cases of determined or undetermined mantids	<i>P. modestus</i> (Masi) <i>P. fraternus</i> (Motschulsky)
HEMIPTERA	
<i>Antestiopsis orbitalis bechuana</i> Kirkaldy	<i>P. africanus</i> (Waterston)
<i>Antestiopsis</i> spp.	<i>P. africanus</i> (Waterston)
LEPIDOPTERA	
In many cases parasitism known to be or probably secondary	
<i>Acracoma remipedalis</i> Karsch	<i>P. acraconae</i> sp. n.
<i>Agonoxena</i> sp.	<i>P. parvulus</i> (Ferrière)
<i>Anaphe infracta</i> Walsingham	<i>P. telenomi</i> (Crawford)
<i>Artona catoxantha</i> Hampson	<i>P. ptychomyiae</i> (Ferrière)
	<i>P. elasmii</i> (Ashmead)
	<i>P. imbreus</i> Walker
<i>Ascotis</i> sp.	<i>P. angustifrons</i> sp. n.
<i>Attacus atlas</i> L.	<i>P. elasmii</i> (Ashmead)
<i>Borbo impar</i> Mabille	<i>P. elasmii</i> (Ashmead)
<i>Busseola fusca</i> Hampson	<i>P. homoeus</i> (Waterston)
<i>Busseola</i> sp. or spp.	<i>P. furvum</i> (Gahan)
<i>Charaxes</i> sp.	<i>P. neavei</i> (Waterston)
<i>Chilo</i> sp. or spp.	<i>P. furvum</i> (Gahan)
<i>Cosmopteryx pallifasciella</i> Snellen	<i>P. thoracicus</i> (Zehntner)
<i>Cremotopsycha pendula</i> Joannis	<i>P. anomalus</i> (Gahan)
	<i>P. imbreus</i> Walker
<i>Dasychira goodii</i> Holland	<i>P. arcuatus</i> sp. n.
? <i>Dasychira</i> sp.	<i>P. angustifrons</i> sp. n.
<i>Dioryctria splendidella</i> Herrich-Schäffer	<i>P. occipitalis</i> sp. n.
<i>Epicephala chalybacma</i> Meyrick	<i>P. imbreus</i> Walker
<i>Erionota thrax</i> L.	<i>P. erionotae</i> sp. n.
<i>Lamprosema camphorae</i> Tams	<i>P. elasmii</i> (Ashmead)
<i>Laphygma exempta</i> Walker (see <i>Spodoptera</i> )	
<i>Leucoptera</i> spp.	<i>P. coffeicola</i> (Ferrière)
<i>Lithocolletis</i> sp.	<i>P. stenochoreus</i> sp. n.
Lymantriid indet.	<i>P. rhyssonotus</i> sp. n.
Lymantriid indet. (on cocoa)	<i>P. longisetosus</i> sp. n.
? <i>Marasmia trapezalis</i> Guenée	<i>P. acantha</i> (Walker)
<i>Melanitis constantia</i> (Cramer)	<i>P. inexpectatus</i> sp. n.

Host

Parasite

*Metadrepana* sp.  
*Metisa plana* Walker  
  
*Mylothris* sp.  
*Nephantis serinopa* Meyrick  
*Nephopteryx rhodobasalis* Hampson  
*Odites* sp.  
*Ophioderes fullonia* (Clerck)  
*Pachypasa* sp.  
*Pectinophora gossypiella* Saunders  
*Phalaenoides glycinae* Lewin  
  
*Pieris rapae* L.  
*Plutella xylostella* (L.) (= *maculipennis*  
 (Curtis))  
*Proceras indicus* Kapur  
*Pyrausta machaeralis* Walker  
*Rhyacionia cristata* Walsingham  
*Sesamia* sp. or spp.  
  
*Spodoptera* (= *Laphygma*) *exempta*  
 (Walker)  
*Sylepta derogata* Fabricius  
 moth pupa on *Deguelia*

*P. taylori* sp. n.  
*P. elasmii* (Ashmead)  
*P. anomalus* (Gahan)  
*P. imbreus* Walker  
*P. taylori* sp. n.  
*P. imbreus* Walker  
*P. stenochoreus* sp. n.  
*P. angustifrons* sp. n.  
*P. agaristae* (Cameron)  
*P. anastati* (Crawford)  
*P. waterstonii* (Masi)  
*P. agaristae* (Cameron)  
*P. pieridis* sp. n.  
*P. pieridis* sp. n.  
*P. pieridis* sp. n.  
  
*P. elasmii* (Ashmead)  
*P. soror* sp. n.  
*P. occipitalis* sp. n.  
*P. furvum* (Gahan)  
*P. bethylicidus* sp. n.  
*P. afronigripes* nom. n.  
*P. amaurocoelus* (Waterston)  
*P. amaurocoelus* (Waterston)  
*P. soror* sp. n.

COLEOPTERA

*Aspidomorpha* spp. (larvae or pupae)  
*Aspidomorpha* spp. (ova)  
*Coelaenomenodera elaidis* Maulik

*Endelus bakeri* Kerremans  
*Epilachna* spp. and related genera

*Exophthalmus vitticollis* Champion  
*Promecotheca cummingii* Baly

*Promecotheca nuciferae* Maulik  
*Promecotheca* sp.

*P. aspidomorphae* (Girault)  
*P. praeveniens* sp. n.  
*P. setigerus* Kerrich  
*P. coffeicola* (Ferrière)  
*P. viginquinque* Kerrich  
*P. parvulus* (Ferrière)  
*P. anomalus* (Gahan)  
*P. foveolatus* (Crawford)  
*P. amaurocoelus* (Waterston)  
*P. irregularis* sp. n.  
*P. anomalus* (Gahan)  
*P. parvulus* (Ferrière)  
*P. imbreus* Walker  
*P. painei* (Ferrière)  
*P. parvulus* (Ferrière)



Host	Parasite
DIPTERA	
<i>Anacamptomyia bisetosa</i> Roubaud & Villeneuve	<i>P. ropalidiae</i> (Risbec)
<i>Melanagromyza vignalis</i> Spencer	<i>P. vignae</i> (Risbec)
<i>Phytomyza</i> sp.	<i>P. acanthae</i> (Walker)
<i>Sarcophaga</i> sp.	<i>P. elasmii</i> (Ashmead)
Tachinidae (various)	<i>P. ptychomyiae</i> (Ferrière)
Diptera indet. (in stem of millet)	<i>P. dipterae</i> (Risbec)
Diptera indet. (leaf-miner)	<i>P. acantha</i> (Walker)
Diptera indet. (in mines of <i>Amomum</i> )	<i>P. anomalus</i> (Gahan)
HYMENOPTERA-ACULEATA	
? <i>Acantholepis</i> sp.	<i>P. marjoriae</i> sp. n.
<i>Belonogaster junceus</i> Fabricius	<i>P. ropalidiae</i> (Risbec)
<i>Belonogaster</i> sp.	<i>P. ropalidiae</i> (Risbec)
<i>Crematogaster</i> sp. (inquiline of)	<i>P. acraconae</i> sp. n.
<i>Polistes</i> sp.	<i>P. ropalidiae</i> (Risbec)
<i>Ropalidia guttatipennis</i> Saussure	<i>P. ropalidiae</i> (Risbec)
<i>Synagris cornuta</i> Fabricius	<i>P. clinognathus</i> (Waterston)
HYMENOPTERA-PARASITICA	
<i>Achrysocharis orientalis</i> (Ferrière)	<i>P. imbreus</i> Walker
<i>Apanteles</i> sp. or spp.	<i>P. angustifrons</i> sp. n.
	<i>P. neavei</i> (Waterston)
	<i>P. afronigripes</i> nom. n.
	<i>P. ptychomyiae</i> (Ferrière)
	<i>P. elasmii</i> (Ashmead)
	<i>P. erionotae</i> sp. n.
	<i>P. imbreus</i> Walker
	<i>P. anastati</i> (Crawford)
	<i>P. neavei</i> (Waterston)
	<i>P. taylori</i> sp. n.
	<i>P. vigintiquinque</i> Kerrich
	<i>P. amaurocoelus</i> (Waterston)
	<i>P. bethylicidus</i> sp. n.
	<i>P. africanus</i> (Waterston)
	<i>P. carinatiscutum</i> (Girault)
	<i>P. imbreus</i> Walker
	<i>P. bethylicidus</i> sp. n.
	<i>P. imbreus</i> Walker
	<i>P. vigintiquinque</i> Kerrich
	<i>P. vigintiquinque</i> Kerrich
	<i>P. telenomi</i> (Crawford)
	<i>P. africanus</i> (Waterston)
<i>Anastatus</i> sp.	
<i>Brachymeria</i> sp.	
<i>Charops</i> sp.	
<i>Cotterellia podagrica</i> Waterston	
<i>Ecphoropsis</i> sp.	
<i>Goniozus</i> sp.	
<i>Gryon antestiae</i> (Dodd)	
Microgasterine indet.	
<i>Parasierola nephantidis</i> Muesebeck	
<i>Parasierola</i> sp.	
<i>Pediobius setigerus</i> Kerrich	
<i>Sympiesis kampalanus</i> (Ferrière)	
<i>Telenomus gowdei</i> Crawford	
<i>Trissolcus seychellensis</i> Kieffer	

Host

Parasite

ARANEIDA

Spider's egg-sac

*P. brachycerus* (Thomson)

*P. wilderi* (Howard)

Spider's egg-sac (supposed)

*P. carinatiscutum* (Girault)

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